1952.

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QUEENSLAND.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE AND STOCK

FOR

THE YEAR 1951-52.

PRESENTED TO PARLIAMENT BY COMMAND.

BRISBANE:
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A. 52—1952

COMMONWEALTH MYCOLOGICAL INSTITUTE
17 JAN 1953

ORGANISATION OF THE DEPARTMENT AS AT 30th JUNE, 1952.

SECRETARY FOR AGRICULTURE AND STOCK .. .. Hon. H. H. Collins, M.L.A.

CENTRAL ADMINISTRATION—

Under Secretary	A. F. Bell, M.Sc., D.I.C., A.R.A.C.I.
Assistant Under Secretary (Technical)	R. Veitch, B.Sc.Agr., B.Sc.For.
Assistant Under Secretary	W. T. Gettons, A.I.C.A.
Special Administration Officer	H. Barnes.
Officer in Charge, Information Services	C. W. Winders, B.Sc.Agr., A.C.I.S.
Accountant	E. C. Sadler, A.A.U.Q.

DIVISION OF PLANT INDUSTRY—

Director of the Division	W. A. T. Summerville, D.Sc.

Agriculture Branch—

Director of Agriculture	D. O. Atherton, Q.D.A., M.Sc.Agr.

Regional Experiment Stations—

Director of Regional Experiment Stations	W. G. Wells.

Horticulture Branch—

Director of Horticulture	S. A. Trout, M.Sc., Ph.D.

Science Branch—

Officer in Charge	J. H. Simmonds, M.B.E., M.Sc.

Chemical Laboratory—

Agricultural Chemist and Biochemist	M. White, M.Sc., Ph.D., A.R.A.C.I.

DIVISION OF ANIMAL INDUSTRY—

Director of the Division	W. Webster, B.V.Sc.
Assistant Director	A. L. Clay, B.V.Sc.

Veterinary Services Branch—

Director of Veterinary Services	C. R. Mulhearn, B.V.Sc.

Animal Health Stations—

Director of Research	J. Legg, B.Sc., D.V.Sc., M.R.C.V.S.

Sheep and Wool Branch—

Director of Sheep Husbandry	G. R. Moule, B.V.Sc.

Cattle Husbandry Branch—

Officer in Charge	R. D. Chester, B.V.Sc.

Pig Branch—

Officer in Charge	F. Bostock.

Poultry Branch—

Officer in Charge	P. Rumball, R.D.A.

DIVISION OF DAIRYING—

Director of Dairying	E. B. Rice, Dip.Ind.Chem.

Field Services Branch—

Director of Field Services	R. A. Paul, B.Sc.Agr.

Research Branch—

Director of Research	L. E. Nichols, B.Sc.Agr., A.R.A.C.I.

DIVISION OF MARKETING—

Director of Marketing	H. S. Hunter.
Assistant Director of Marketing	C. H. P. Defries, H.D.A., B.Com., A.F.I.A.

Standards Branch—

Standards Officer	F. B. Coleman

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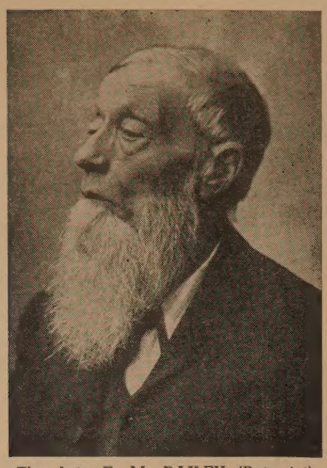
Map Showing Distribution of Departmental Services.
(For details see opposite page.)

Key to Map Showing Departmental Services.

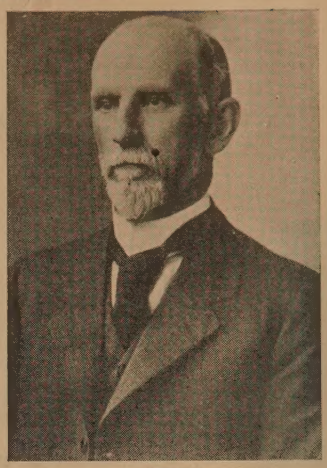
Centre.	Full-time Services Provided.
Allora	Dairying.
Alpha	Stock Inspection.
Atherton	Agriculture, Cattle, Pigs, Poultry, Soil Conservation, Stock Inspection, Veterinary Services.
Ayr	Agriculture, Entomology, Stock Inspection, Regional Experiment Station.
Barcaldine	Sheep and Wool, Veterinary Services.
Beaudesert	Agriculture, Dairying, Stock Inspection.
Beenleigh	Horticulture.
Biggenden	Dairying.
Biloela	Dairying, Pigs, Stock Inspection, Regional Experiment Station.
Blackall	Sheep and Wool.
Boonah	Agriculture, Dairying, Stock Inspection.
Boondooma	Stock Inspection.
Bowen	Horticulture, Stock Inspection.
"Brian Pastures"	Pasture Research Station (Australian Meat Board Station).
Brisbane	Central Administration and all services; Animal Health Station (Yeerongpilly).
Bundaberg	Agriculture, Dairying, Poultry, Stock Inspection.
Caboolture	Dairying, Horticulture.
Cadarga	Stock Inspection.
Cairns	Horticulture, Plant Pathology, Stock Inspection, Horticultural Field Station (Kamerunga).
Charleville	Sheep and Wool, Stock Inspection.
Charters Towers	Stock Inspection.
Chinchilla	Dairying, Stock Inspection.
Clare	Tobacco Experiment Farm; Pasture Pilot Plots.
Clermont	Cattle, Stock Inspection.
Cloncurry	Stock Inspection, Veterinary Services.
Coolangatta	Horticulture, Stock Inspection.
Cooroy	Dairying, Horticulture.
Crow's Nest	Dairying, Stock Inspection.
Cunnamulla	Sheep and Wool, Stock Inspection.
Dalby	Dairying, Sheep and Wool, Veterinary Services.
Emerald	Cattle, Sheep and Wool, Stock Inspection.
Esk	Dairying.
Gatton	Dairying, Pastures.
Gayndah	Agriculture, Cattle, Horticulture, Stock Inspection.
Gladstone	Dairying, Stock Inspection.
Goombungee	Dairying.
Goondiwindi	Stock Inspection.
Gympie	Agriculture, Dairying, Horticulture. Stock Inspection.
Helidon	Stock Inspection.
Hermitage	Regional Experiment Station.
Hughenden	Sheep and Wool, Stock Inspection.
Ingham	Stock Inspection.
Injune	Stock Inspection.
Innisfail	Dairying, Stock Inspection.
Ipswich	Agriculture, Dairying, Poultry, Stock Inspection.
Jandowae	Dairying, Stock Inspection.
Julia Creek	Sheep and Wool, Stock Inspection.
Kairi	Regional Experiment Station.
Killarney	Dairying, Stock Inspection.
Kingaroy	Agriculture, Cattle, Dairying, Soil Conservation, Stock Inspection, Veterinary Services.
Laidley	Dairying.
Lake Nash	Stock Inspection.
Longreach	Sheep and Wool, Stock Inspection.
Mackay	Agriculture, Dairying, Stock Inspection.
Malanda	Dairying.
Mareeba	Agriculture, Stock Inspection, Tobacco Experiment Farm.
Maryborough	Dairying, Horticulture, Stock Inspection, Veterinary Services.
Miles	Stock Inspection.
Millmerran	Dairying, Stock Inspection.
Monto	Dairying, Stock Inspection.
Mount Isa	Stock Inspection.
Mundubbera	Dairying, Stock Inspection.
Murgon	Dairying, Stock Inspection.
Nambour	Dairying, Horticulture, Entomology, Plant Pathology, Stock Inspection, Maroochy Experiment Station (Horticulture).
Nanango	Dairying, Stock Inspection.
Normanton	Stock Inspection.
Oakey	Dairying.
Oonoonba	Animal Health Station.
Ormiston	Redlands Experiment Station (Horticulture).
Pittsworth	Cattle, Dairying, Soil Conservation, Stock Inspection.
Proston	Dairying.
Quilpie	Stock Inspection.
Rockhampton	Agriculture, Cattle, Dairying, Horticulture, Poultry, Slaughtering Inspection, Stock Inspection, Veterinary Services.
Roma	Sheep and Wool, Stock Inspection, Veterinary Services.
South Johnstone	Bureau of Tropical Agriculture; Utchee Creek Pasture Sub-station.
Southport	Dairying, Horticulture, Stock Inspection.
Stanthorpe	Horticulture.
St. George	Sheep and Wool, Stock Inspection.
Toogoolawah	Stock Inspection.
"Toorak"	Sheep Field Station.
Toowoomba	Agriculture, Dairying, Entomology, Horticulture, Pigs, Plant Pathology, Poultry, Slaughtering Inspection, Soil Conservation, Stock Inspection, Veterinary Services. Dairy Research Laboratory.
Townsville	Horticulture, Poultry, Slaughtering Inspection, Stock Inspection, Veterinary Services.
Wallan-garra	Horticulture.
Wandoan	Stock Inspection.
Warwick	Agriculture, Dairying, Pigs, Sheep and Wool, Slaughtering Inspection, Soil Conservation, Stock Inspection.
Winton	Sheep and Wool, Stock Inspection.
Wondai	Stock Inspection.
Wowan	Dairying.
"Wrotham Park"	Gulf Exploratory Farm.
Yarraman	Stock Inspection.

SOME PAST HEADS OF PLANT INDUSTRY BRANCHES.

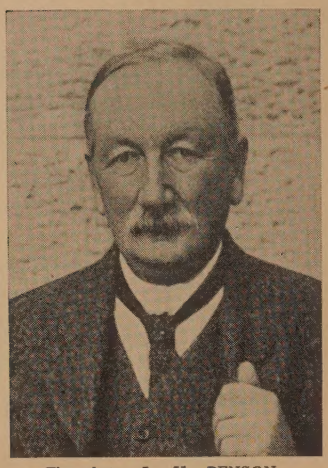


The late F. M. BAILEY (Botanist).

The late C. T. WHITE (Botanist).



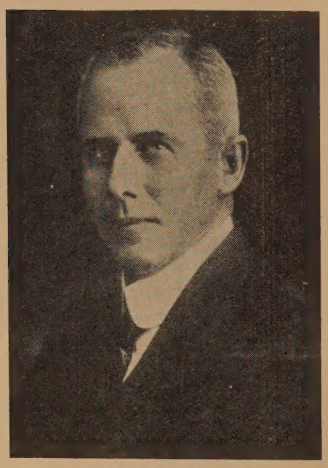
The late HENRY TRYON (Entomologist).



The late A. H. BENSON (Horticulturist).

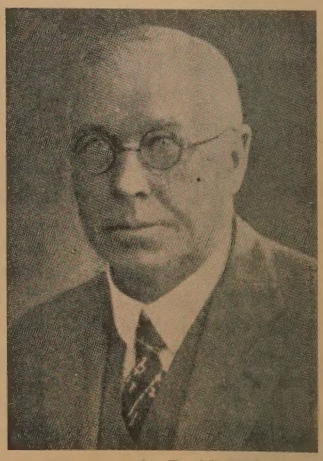
The late C. G. WILLIAMS (Horticulturist).

H. BARNES (Horticulturist; now Special Administration Officer).

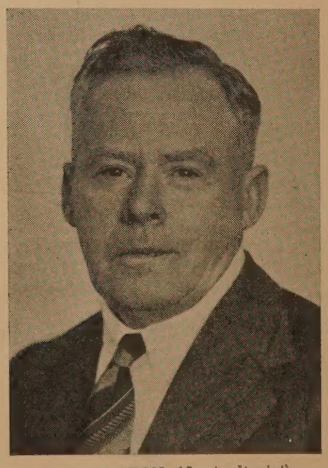


H. C. QUODLING (Agriculturist).

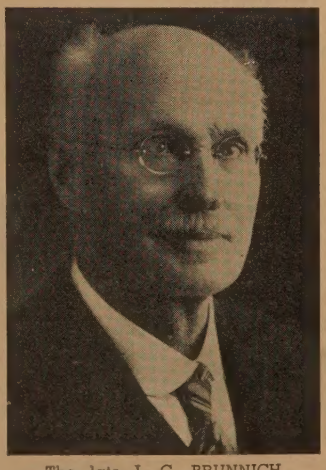
G. B. BROOKS (Agriculturist).



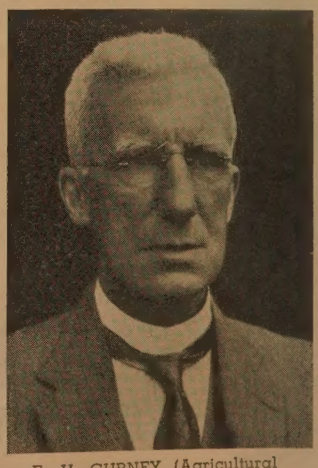
The late A. E. GIBSON (Agriculturist).



C. J. McKEON (Agriculturist).



The late J. C. BRUNNICH (Agricultural Chemist).



E. H. GURNEY (Agricultural Chemist).

REPORT OF THE DEPARTMENT OF AGRICULTURE AND STOCK FOR THE YEAR 1951-52.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

DEAR SIR,—I have the honour to submit herewith the Annual Report on the activities of the Department of Agriculture and Stock for the year ended 30th June, 1952.

A. F. Bell.

Continuing the change effected in my last Report this introduction is followed by the Reports of the Directors of the several Divisions and a broad picture of the major activities of the Department may be obtained by the reading of these first five sections. The Branch Reports, which follow, present a more detailed picture of technical investigations and extension activities.

The fears of an impending serious drought expressed in last year's report proved, unfortunately, to be well-founded. Absence of normal spring storms, and the delayed onset of the wet season, brought about the worst drought of recent times. Greatly reduced production was characteristic of all agricultural and pastoral industries and the latter will require some years to recover; references to these effects will be found throughout the body of this Report.

Since the drought did not break until the end of February, winter pastures have been much more nutritious and palatable than is normally the case. Relatively mild temperatures and fair to good rainfall have resulted in very favourable winter and spring seasonal conditions. At the time of writing the prospects are satisfactory in all parts of the State other than the north-west, where the drought persists.

World prices for primary products have shown a tendency to decline; concurrently Australia's exportable surplus of primary produce has also declined as a result of increased domestic consumption by the rising population. The effect of these two trends has been aggravated by the bad drought in Queensland and Northern Australia generally. The seriousness of the situation is obvious from the following:—

—	1950–51.	1951–52.
	£	£
Total value of imports into Australia ..	743,871,000	1,053,217,000
Total value of exports from Australia ..	981,796,000	675,614,000
Value of exports of primary produce (including processed foods)	886,302,000	544,644,000
Ratio of primary to total exports	90·3%	80·6%

In order to meet the immediate problem of the adverse trade balance the Commonwealth Government has instituted a stringent rationing of imports. However, the permanent solution of the problem lies only in a marked increase in exports and it is obvious from the above table that this can be brought about only by increasing primary production.

As a first step towards bringing about this desired increase the Australian Agricultural Council in April promulgated a series of production targets. At the same time it listed the impediments in the way of achieving such targets and indicated the avenues in which assistance or relief should be given. It is pleasing to be able to record that as a result of the efforts of the Council there is already being effected an appreciable improvement in the supply of some materials, particularly steel and galvanised goods. Steps have also been taken to relieve the long-standing superphosphate shortage by assisting the stepping up of the Australian production of sulphur. Considerable tax concessions have been granted to primary producers. The availability of rural labour improved materially during the year.

The foregoing should go a considerable way towards raising production on existing farms; there remains the important but more difficult problem of increasing the number of farms. The highly mechanised farm of to-day requires a much greater capital investment in plant and equipment, while costs of development have soared beyond those ruling a generation ago. In these circumstances it is difficult for individuals to acquire sufficient capital to develop, equip, and stock; furthermore, it is difficult to devise a price structure which will yield equitable returns to the owners of new and long-established farms. Yet, difficult as these problems may be, on their solution depends the future of Australia as a sovereign country.

Intensification and increase of primary production will be in large measure dependent upon expanded technical services from institutions such as the Departments of Agriculture. The Commonwealth Government has announced that it will make available a sum of £200,000 annually to assist the State Departments in their drive for more production. Although this sum represents considerably less than 5 per cent. of the annual cost of existing technical services in the State Departments of Agriculture, it will assist in the task ahead.

THE PASTORAL INDUSTRIES.

Once again widespread drought has dealt a serious blow to the wool and beef industries, lowering output, depleting flocks and herds, and reducing the capacity for natural increase which is essential to expansion of the two industries.

Because of difficult conditions on stock routes, the normal heavy flow of store cattle from the Northern Territory into Queensland was reduced to a trickle and no other outlet was available. This, and heavy losses in remote parts of the State, led to renewed agitation for the building of railways to bridge the gaps between the Territory and north-western breeding areas and the existing Queensland railway system. Advocacy of railway extensions and rail links to enable more ready movement of stock from or through drought-striken areas to agistment, fattening areas, or market is of long standing and has been recommended by more than one Royal Commission. On the other hand, the magnitude and the implications of the task are such as to justify its being regarded as a National rather than a State responsibility. It is probable that in these breeding areas more cattle are lost by death than are marketed, and this represents a serious loss of both food and wealth.

Important though it be, improved transport is by no means the solution for all problems and there is much to be done in the direction of improving properties, while the question of suitability of breeds requires objective study. It may be that existing British breeds are the best for Queensland tropical conditions but it seems improbable; whatever the answer is, it certainly should be determined—and not merely assumed.

During the recent drought normal restrictions on stock movements were relaxed to permit certain stock to enter Queensland from the drought-stricken Northern Territory, though appropriate safeguards were taken. Additional dipping facilities, which have been provided against such an emergency on the western border in recent years, were extremely helpful in facilitating stock movements during the drought.

Foot and mouth disease, which has broken out with renewed severity in Europe and spread to countries with a wide geographical distribution, presents a distinct threat to the major livestock industries, and rigid quarantine measures are being taken with a view to ensuring Australia's continued freedom from it. This Department is very much alive to the potential menace of this and other exotic diseases: A veterinary officer was sent overseas last year to make a special study of such diseases and he has since been directed to make a close examination of outbreaks of foot and mouth disease in western Europe so that first-hand information on diagnosis and treatment will be available here should the disease gain entry.

The main worries of wool-growers during 1951-52 changed from blowfly and parasitic worms to drought, dingoes and reduced wool prices. At the time of writing, the north-western sheep districts are still in the throes of drought and heavy losses have occurred. The few hay balers which appeared in western districts in recent years were put to good use prior to the drought and the bush hay conserved proved very useful in drought feeding. While it is true that much hay made from the Mitchell grasses does not of itself constitute a ration sufficient for full maintenance, it may be possible to supplement it with chemicals or concentrates. The practice and economics of bush hay conservation and supplementation are to be studied by the Department on the Toorak Sheep Field Station, near Julia Creek.

The periodic reduction in flock numbers by drought is the greatest problem of the sheep industry. Over the past 60 years flock numbers have averaged about 18·5 millions; after decimation by drought the numbers slowly rise above average only to be depleted again in a few years by the next drought. The position has now become serious: From the peak of 25·65 millions in 1942 the numbers declined to 16·1 millions in 1947 and now for the sixth year in succession have been well below the 60 years' average; in only six years during the past half century have they been less than in this year (16,156,000).

Despite a substantial fall in wool prices from the spectacular heights of the 1949-50 and 1950-51 seasons, the wool industry is still Queensland's greatest single money-earner. When wool auctions were resumed in 1946-47, Queensland's offerings realised £16½ millions. The figures for the three succeeding years were (approximately) £28½ millions, £31½ millions and £45¼ millions. Sales during the 1950-51 season amounted to £99 millions, the average price per bale for 554,705 bales being £178 14s. 5d. The 1951-52 selling season yielded approximately £49 millions, 467,265 bales averaging £104 15s. 6d. per bale.

The recent acquisition of four properties paves the way for an expansion of carefully controlled investigations of various problems of livestock husbandry in Queensland. Already the Sheep Field Station in the north-west has been improved sufficiently to enable experimental work to be started, and this work will be extended as soon as the drought breaks. A beef cattle breeding research station near Rockhampton, purchased by the Australian Meat Board, is now being developed by C.S.I.R.O., while a beef cattle husbandry research station near Gayndah, which this Department is staffing, is being prepared for an early start on grazing and related trials. The resumption of land in the Brisbane area for the purpose of establishing an animal husbandry station has been completed, and husbandry work now being conducted at Yeerongpilly Animal Health Station will in due course be transferred to the new station and expanded.

BREED IMPROVEMENT.

During a visit to the United States in December-January, the writer made a special point of examining livestock breeding work being carried out by official and other organisations. This work has already resulted in the establishment of new breeds of great potential value and has indicated that various other crosses, as well as new lines in established breeds, may be expected to yield animals superior to those at present in use.

Cattle breeders in the southern United States, and in Central and South America, have in recent years given a great deal of attention to the humped Indian or Brahman cattle (*Bos indicus*) owing to their greater tolerance of heat,

humidity, and external parasites. These cattle are now being widely used in beef herds as a pure breed but mainly as hybrids or in the synthesis of new breeds incorporating Indian and British breeds (Shorthorn, Hereford and Aberdeen Angus).

The outstanding new breed, Santa Gertrudis, is rated as five-eighths Shorthorn and three-eighths Brahman. It was bred by the Klebergs of King Ranch, Texas, and is very impressive in the region where it was developed. There is every reason to believe that it will thrive in at least parts of Queensland and prove wholly acceptable as a commercial herd. The King Ranch, in association with some leading Australian cattlemen, has now imported a purebred herd of some 250 bulls and heifers. The establishment of stud and commercial herds of this breed in Queensland will be watched with interest.

The use of hybrids of Brahman and British breeds is increasing in North Queensland and is particularly evident in the Cape York Peninsula where conditions do not entirely favour existing British breeds. While this hybridisation has been haphazard in many cases, it is of interest to note that some breeders in North Queensland are using only the quieter strains of Brahman and are culling progeny with evidence of wildness. It is expected that the cattle breeding station at Belmont will make comprehensive tests of the performance of the various breeds available as well as initiating the synthesis of new breeds.

The United States Department of Agriculture has imported from India representatives of a milking breed of cattle, the Red Sindhi. These have been crossed with Jerseys for the purpose of combining the heat and humidity tolerance of the Red Sindhi with the milk production of the Jersey. Herds of first- and second-class cows seen at Beltsville and in Louisiana were performing very satisfactorily; it is proposed to stabilise a breed with about three-eighths Red Sindhi. There is no doubt that the production of the British dairy breeds falls off under tropical conditions and an answer to this problem may well be in the use of this breeding technique.

Promising advances in production have also been obtained by crossing and back-crossing pure lines of European breeds of dairy cattle (particularly) as well as of beef cattle, sheep, pigs, and poultry. Two new breeds of pig have also recently been established in the United States, the first combining the Danish Landrace and Poland China, and the second Landrace and Berkshire.

There is ample room for improvement in all classes of livestock in Queensland. The approach in the past has been along the lines of raising the flock or herd average nearer to the performance of the top animals; improvement by this means has been painfully slow. It behoves Queensland stock-owners to take full advantage of overseas work on livestock improvement, but it is not unlikely that by developing crosses under local conditions better breeds will be produced here.

MINERAL DEFICIENCIES AFFECTING LIVESTOCK.

There is ample evidence that the soils of vast areas of our grazing land are deficient in available phosphate, and that this deficiency is reflected in the health and production of livestock depastured on that land. Growth rate is lowered, milk production decreases, depraved appetite is evident, and softbone is of frequent occurrence. Phosphorus deficiency of livestock in Queensland has been recognised for many years and on many properties corrective measures are employed as a matter of course. These may take the form of pasture topdressing or, more commonly, supplying phosphorus compounds to the animals as licks.

Copper deficiency has been recognised in sheep for some years but was first diagnosed in cattle in Queensland by Departmental officers in 1950. The occurrence of this trouble has since been observed among cattle depastured on coastal properties between the southern border and Rockhampton. A good deal of country in this coastal strip has for many years been regarded as poor country for cattle but the cause was never clear. It now appears that a deficiency of copper, and perhaps other trace elements, may be the main cause. As with phosphorus deficiency, the obvious practical remedial measures are topdressing of pastures and the provision of licks.

The solution to the problem of correcting mineral deficiencies in grazing animals is, however, not so simple as might appear at first glance. Pasture improvement by topdressing is uneconomical where for various reasons intensive use of the land is not feasible. Initially it may involve a complete change-over to new species or perhaps the clearing of standing timber from the grazing paddocks. Expensive soil treatments may be required to prevent the locking-up of minerals in the soil. Yet it must be recognised that licks are merely a palliative and that in the long run the soundest method of correcting deficiencies is to provide the growing plant with its mineral requirements to enable it not only to supply adequate amounts to grazing animals but also to respond fully itself to the stimulus of an adequate plant food supply.

Departmental livestock officers and biochemists have been making a close study of the clinical aspects of copper deficiency in coastal cattle, and a team of crop and pasture specialists is being swung into the investigation in an effort to devise sound agronomic methods of remedying mineral and other deficiencies of soils and plants.

THE DAIRYING INDUSTRY.

Dairy herds which had been slowly built up after the 1946 drought were again seriously depleted during 1951-52. Production fell alarmingly on most farms, where there was little conserved fodder to counteract the shortage of pasture and green feed. Drought relief, interest-free loans accepted by producers from the Government amounted to nearly £300,000, but with fodder at drought prices they were utilised mainly for keeping stock alive.

In most of the recognised dairy countries of the world the incidence of a severe winter is equivalent to a drought every year but adequate steps are taken to conserve the fodder necessary to maintain the herds in good condition and production. On most Queensland dairy farms, unfortunately, the cows go on to short rations for a period every year, and few go through their milking life without suffering drought starvation. The Department is making determined efforts to alter this state of affairs by intensified extension services and by setting up fodder production demonstrations on selected farms.

The past 15 years' statistics covering the percentage of milk which is used for butter, cheese and other manufactured milk products in various countries—though somewhat confused by wartime and post-war butter rationing and the tendency to standardise the fat content of milk—show a very marked trend to increased consumption of liquid milk. This has resulted in a marked drop in the per capita consumption of butter and cheese in some of the main consuming countries. Since 1938, butter consumption in the United States of America has fallen from 16 lb. to 10 lb. per head, in New Zealand from 43 lb. to 38 lb., in the United Kingdom from 24 lb. to 14 lb., and in Australia from 33 lb. to 30 lb. It is significant that current total butter consumption in the United States is equal to this year's household butter ration in the United Kingdom; when butter used in cafes, canteens, &c., is added it raises United Kingdom consumption considerably above that of the United States.

Nutrition programmes which stress the protective health value of liquid milk and concede the nutritive value of vitamin-fortified margarine, together with food habits which utilise much lard and dripping, will no doubt continue to reduce the per capita consumption of butter in most countries. The position of margarine as a competitor of butter has been strengthened by both intermittent shortages of butter and its rapidly rising cost. In the United States, with no subsidy on butter, its cost is somewhat more than twice that of margarine. Producers have been protected for many years in Australia by legislation permitting limits to be placed on the amount of table margarine which may be manufactured. There is now a tendency to relax these controls somewhat and in Queensland the aggregate annual margarine quotas have been increased to 4,340 tons It is apparent that there is some consumer resistance to butter sales, indicating the need for constant vigilance in efficiency of production and maintenance of high quality. While the dairy industry is justly entitled to adequate returns on cost of production, no price is satisfactory if the product cannot be sold.

Activities under the Commonwealth Dairy Industry Efficiency Scheme to promote greater efficiency in the dairy industry were considerably hampered by the drought. In particular, the number of cows in production recording groups fell considerably, fewer field days could be held on demonstration farms, concentrate feeding work was curtailed because of the difficulty and cost of securing feedstuffs, and many entrants in the Dairy Farm Competition were obliged to withdraw. The drought nevertheless provided dairy farmers with some pointed object lessons in the results obtained on demonstration farms. Using 1948-49 as the base year, the average production of the demonstration farms declined only 20 per cent. during 1951-52, as compared with the State average farm decline of over 40 per cent.

The period for which the initial Commonwealth Grant was made is now in its last year. The implementing authorities in all States have expressed their desire to have the grant continued, in view of the useful work being done in increasing farm efficiency, and the Commonwealth Government has agreed to consider the matter of providing further funds. The amount made available for 1952-53 is the same as in previous years; because of rising costs of materials and labour, this will necessarily mean a decline in the services provided under the scheme. It is hoped that in the second period of the scheme sufficient funds will be made available to enable services to be progressively expanded rather than progressively contracted as is inevitable with a fixed grant.

QUALITY OF DAIRY PRODUCTS.

In a warm region such as Queensland, the temperature factor alone demands the adoption of care in producing and handling raw milk and milk products if the consumer is to be supplied with wholesome and nutritious articles of diet. When additional adverse factors, such as weedy pastures and unsuitable water supplies, come into play, particular care must be exercised by producer, carrier, processor, and distributor.

In spite of the availability of a good extension service it cannot be said that conditions on the production side are satisfactory. Graders on the receiving platforms of factories and depots find far too much milk and cream that shows evidence of carelessness on the farm. While some of the faults of the lower grades of milk and cream can be eliminated in the factory, others persist through the manufacture and lead to degrading of butter and cheese. It is apparent, too, that manufacturing methods are sometimes at fault, and the factory operative—no less than the farmer—requires to exercise care and skill at all times.

It is obvious too that there is an inadequate margin between the prices for choice and first grade cream (½d. per lb.) and first and second grade cream (1d.). These are minimum margins as prescribed by the Dairy Acts of the several States but they have been treated as fixed margins. When first prescribed in 1935 the deduction of ½d. represented 5 per cent. of the then return of 9½d. per lb. of commercial butter; today it represents little more than 1 per cent. of the return of 3s. 10½d. per lb. Irrespective of the calibre of technical services, quality standards do not usually attain satisfactory levels in the absence of a rational price incentive.

Officers of the Field Services Branch of the Division of Dairying paid more than 20,000 visits to farms during the past year, examining

production methods with special reference to milk and cream quality. These visits were supplemented by farm inspections by officers of the Dairy Research Branch, who were largely checking back on graders' and technologists' reports on sub-standard supplies.

In addition to examining raw milk and cream supplies, technologists throughout the year maintained routine quality control services designed to improve or at least maintain the quality of the out-turn of factories. They also carried out numerous investigations of problems and methods of manufacture and handling.

The Department's Dairy Research Laboratories are situated at Brisbane and Toowoomba. While the concentration of work at these two centres has not unduly circumscribed the activities of the Dairy Research Branch, it is not an ideal arrangement. The Department accordingly welcomed offers of co-operation by two dairy co-operatives in establishing and conducting laboratories at Malanda and Murgon respectively. Equipment for the two new laboratories is now on order and with the four Departmental laboratories operating, and the Port Curtis group of factories continuing their Gladstone laboratory, all districts will have fairly ready access to specialist services.

BOVINE TUBERCULOSIS CONTROL.

The Departmental campaign for the control of tuberculosis in dairy cattle has gained impetus each year since it was begun in the Brisbane milk supply district in 1945. The number of dairy cattle embraced by the tuberculin testing scheme is now about 300,000 and individual tests conducted on these cattle during the past year numbered 160,264 (it is not necessary to test all cattle every year).

The object of the scheme is to reduce the incidence of tuberculosis in dairy cattle as far as is practicable and hold it at that level to ensure that all milk and cream supplied for human consumption in the fresh and processed state is virtually free from tuberculosis bacteria. All dairy herds in the Brisbane, Darling Downs, Kingaroy, Gympie, and Bundaberg districts, supplying either milk or cream, are under test, as are the herds supplying wholemilk to most of the cities of the State.

Results comparable with those obtained in the United States have been secured, less than 1 per cent. of the cattle currently being tested showing a positive reaction to the test. United States experience is that absolute eradication cannot be expected; hence the reduction achieved in Queensland is regarded as very satisfactory, particularly in view of the fact that new untested areas are continuously being brought into the scheme. In the south-eastern districts where testing has been proceeding for some years, the percentage of reactors is now as low as 0·64 per cent., compared with 11·86 per cent. in the first year of testing.

It is expected that the tuberculosis control scheme will continue to expand steadily and that all the main dairying districts will eventually be covered. The progress made to date is due largely to the policy of offering tuberculin-testing contracts to private veterinary practitioners to induce them to establish practices in country districts which otherwise would not offer an adequate income initially. There are now 22 veterinary surgeons holding Departmental contracts for tuberculin testing; seven received contracts during the past year. In its four years of operation the scheme has established University-trained veterinarians in 13 country centres which previously had no such service.

CALF FEEDING.

Livestock statistics for Queensland show over 170,000 calves being carried on dairy farms at each annual livestock census date. These calves are mostly heifers being raised to replace adult cows. The huge volume of milk consumed by calves on dairy farms is a feature of current calf-rearing practices with major implications. Milk can no longer be regarded as a cheap home-produced stock food. This is particularly so on wholemilk and cheese-milk farms, but the feeding of even skim-milk to calves in large amounts is an uneconomical method of utilising this by-product.

There are still many dairy farmers who cling to the traditional view that a calf needs wholemilk for three or four weeks and should not be weaned from skim-milk until at least six months old. There is ample evidence to show that dairy calves can be reared satisfactorily with no wholemilk other than colostrum, and that the feeding of skim-milk can be discontinued after two months or even less. Limited milk feeding necessitates, of course, the supplementation of the lower milk ration which is being fed and the provision of alternative high-energy high-protein foodstuffs in the post-weaning period.

The Cattle Husbandry Branch of the Department has been demonstrating to dairy farmers the details of limited milk-feeding of dairy heifers and securing data on the economics of various methods.

As much of the estimated 60,000,000 gallons of skim-milk used annually for feeding dairy calves in Queensland is wasted because of unbalanced feeding, its recovery for processing could be of material assistance to the industry if it was feasible on a large scale. Moreover, the value of skim milk as a human food has yet to be appreciated in Australia, where we place undue emphasis on fat.

A second phase of calf-raising which is being studied by the Cattle Husbandry Branch is the rearing of male calves on the dairy farm for slaughter as baby beef. This is widely practised in England and accounts for the popularity of dual-purpose breeds of cattle in that country. While the dual-purpose breeds are low in numbers in Queensland, dairy breeds such as the A.I.S. can be fattened satisfactorily. There is a vast potential for beef production on dairy farms; if each dairy farmer marketed for slaughter only four bullocks per year it would increase the State's beef output by nearly 20 per cent.

COTTON STIMULATION.

There were three major stimulants to interest in cotton planting in the 1951-52 season—an assurance of a satisfactory price, continued evidence of the value of cotton in rotations, and mechanical harvesting.

The average net realisation for seed cotton in the 1950-51 season (21·389d. per lb.) was so much higher than the guaranteed minimum price of 9½d. per lb. which was offered for that and the succeeding four seasons, that many farmers were satisfied to plant in 1951-52 with the expectation of obtaining a return substantially higher than the guaranteed minimum. Dairy farmers had the added incentive that growing cotton and Rhodes grass pasture in rotation is a highly beneficial system of farming in certain districts. Perhaps the overriding factor in persuading farmers to plan cotton sowings for 1951-52, however, was the knowledge that mechanical harvesters would be available on contract to handle a good deal of the anticipated crop.

Unfortunately, plantings, were drastically reduced because of the severe drought while many plantings which were made suffered in various degrees. The crop yielded an estimated 1,200 bales of lint from 4,000 acres planted. Approximately 30 per cent of the crop was harvested by means of mechanical harvesters owned by the Cotton Marketing Board. The Board's fleet now consists of 12 harvesters, which should be ample during the next couple of years to harvest the bulk of those plantings which are adapted to machine-harvesting. The building up of the fleet to its present size within a period of a few years has been assisted by finance guarantees given by the State Government and by special import permits granted by the Commonwealth. Efficient operation of a reasonable number of such machines should remove one very important impediment to cotton growing—the fear of the unavailability of sufficient hand labour for harvest.

Rising costs of production warranted a review of the guaranteed minimum price and the price is expected to be raised to 14d. per lb. of seed cotton but, unfortunately, the guarantee will be restricted to one season.

THE TOBACCO SITUATION.

Disposal of the 1950-51 tobacco leaf harvest at remunerative prices stimulated increased plantings by established growers and induced others to enter the industry. As a consequence, the plantings of 5,200 acres in 1951 were 25 per cent. higher than for the previous season. The yield of 4,500,000 lb. of cured leaf was more than double that of the previous year, though still representing only about one-ninth of Australian consumption of tobacco.

To the dismay of growers, a substantial proportion of the harvest when offered at auction failed to attract acceptable bids and some 24 per cent. of the leaf so far offered remains unsold. Australian manufacturers have long enjoyed tariff concessions on imported tobacco leaf as a reward for absorbing local leaf in their blends. Following the rejection of much of the Queensland leaf at the 1952 sales, the State Government and tobacco growers' organisations appealed to the Commonwealth Government to increase the percentages of local leaf which manufacturers must use to qualify for tariff concessions. The percentages were subsequently doubled; however this action can fail in its objective unless a measure of market security is also ensured by more positive control of imports of both leaf and manufactured tobacco.

Tobacco-leaf curing is a skilled operation, and with the best of equipment an inexperienced operator may quite easily fail to make a good cure. New growers are therefore always advised to gain experience with an accomplished operator before attempting to cure their own leaf. Improvement in tobacco barns during the past 20 years or so has largely been in construction materials. The technique of temperature and humidity control, which is the really important feature of curing, has undergone little change in Queensland. In the United States various other types of fuel have been replacing wood as the source of heat, and it has been demonstrated that an oil fuel gives an equally good cure as wood and in addition gives easier control of the temperature. One serious disadvantage of wood fuel is the danger of destroying barns by fire; this risk is greatly reduced by oil burning. Tests with oil fuel will be carried out by the Department during the coming season.

The expanding tobacco industry requires additional technical services and negotiations for the acquisition of a farm property in the Texas-Yelarbon area are now being completed. A tobacco experiment station will be established on this property and will serve as a base for the technical services in the southern district. Negotiations are also in train for the purchase of land for a permanent experiment station in the Mareeba-Dimbulah area. Staffing remains a serious problem due to the loss in past years of the services of several senior officers with specialised training in tobacco culture.

SUGAR.

On July 1, 1951, the Bureau of Sugar Experiment Stations concluded a period of 51 years as a branch of this Department and control was vested in a Board comprising the Minister, the Under Secretary, one member representing growers of sugar cane and one representing manufacturers of raw sugar.

During July, 1951, a new Sugar Agreement was concluded between the Commonwealth and State Governments; the price of home consumption sugar was increased to £53 6s. 8d. per ton, being equivalent to a retail price of 6½d. per lb. in capital cities. Rapidly increasing costs in the growing, milling and refining sections of the industry resulted in a further price case being submitted to the Federal Government early in 1952. The Government agreed to an interim price increase of 1½d. per lb. which established the existing figure of £65 12s. 10d. per ton.

At the time of this last increase the Federal Government set up a Sugar Inquiry Committee to consider in detail the position of the growing,

milling and refining branches of the industry. This Committee, of which the writer was a member, took evidence in sugar districts as well as in Brisbane, Sydney and Melbourne and submitted an interim report during July, 1952, and the final report on September 15.

During the period October-December, 1951, conferences were held in London between British Commonwealth sugar exporting territories and the Ministry of Food. Following these conferences the Agreement initiated in 1949 was formalised. Under this Agreement Australia has a total export quota of 600,000 tons of sugar, made up of 314,000 tons to be sold at a price to be negotiated annually and 286,000 tons to be sold at world parity plus preferences. The Minister and the Under Secretary were members of the delegation to the conferences.

The seasonal prospects for 1952 crushing have improved since the early estimate owing to the favourable autumn weather and absence of frost damage. Latest figures available suggest that 6,402,000 tons of cane are available for harvest and that the sugar produced should amount to 853,000 tons of 94 n.t. sugar, or about 830,000 tons of bagged sugar. Prospects for the 1953 crop are, at this early stage, very good.

GRAIN CROPS.

Despite adverse growing conditions, the 1951 wheat crop yielded over 6½ million bushels from 550,000 acres harvested for grain. In the circumstances a yield of about 12 bushels per acre was gratifying and amply demonstrated the soundness of the Department's continual emphasis on the necessity for maximum conservation of subsoil moisture. In the main this crop was grown on the subsoil moisture absorbed during the very wet summer of 1950-51.

While 6½ million bushels was sufficient to meet local milling requirements, the importation of a considerable quantity of feed wheat became necessary. The Australian Wheat Board agreed to make supplies of feed wheat available from stocks held in South Australia, but declined to pay freight on such wheat after April 1. This meant that the landed cost of feed wheat in Queensland rose by 3s. 9d. to 15s. 9d. per bushel, so imposing a considerable burden on poultry-farmers and other users. The Queensland Government made urgent requests to the Commonwealth Government to relieve the position, and as no satisfaction was received, the Government decided to suspend, as from May 10, special clauses of State legislation complementary to the Wheat Industry Stabilisation Amendment Act.

The effect of this suspension was the automatic cessation of a bounty of 4s. 1d. per bushel paid by the Commonwealth Government to growers on feed wheat sales. As the Australian Wheat Board's decision not to pay freight had already meant the automatic suspension of an extra charge of 2s. per bushel, the position in May was that Australian growers were receiving for feed wheat only the declared cost of production (10s. per bushel) and forfeiting the extra charge of 2s. and the subsidy of 4s. 1d.

Following negotiations between the parties concerned, the State Government agreed to revoke on June 28 its proclamation suspending certain clauses of the Wheat Agreement, and the Commonwealth undertook to meet the freight on wheat sent interstate to Queensland and Tasmania out of the amount which had been saved in wheat bounty during the period of the suspension.

Wheat plantings for the current season were considerably in excess of those of the past few years and a harvest of at least 16 million bushels is expected, indicating that the post-war expansion of the industry is continuing. This continued expansion justifies the steps being taken by the industry to provide bulk-handling facilities at certain country centres and in Brisbane. It is worthy of note that Queensland is the only State in the Commonwealth in which wheat production is expanding. A committee which during the year enquired into the wheat-growing potential of Queensland concluded that there was suitable soil under suitable climatic conditions sufficient to enable the harvest of some 3·75 million acres of wheat annually.

The sorghum-growing venture of the Queensland-British Food Corporation in Central Queensland was the subject of an enquiry by a special committee of which the writer was a member. Its report is now being considered by the British and Queensland Governments.

Maize growers in southern districts are planting a higher proportion of hybrid maize varieties each year. As hybrids adapted to each maize district become available under the Department's seed certification scheme, the use of open-pollinated types may be expected to decline still further, and within a decade or less districts such as the South Burnett and the Darling Downs may, like the Corn Belt States of America, be planting all hybrids. While the higher yields per acre mean a greater profit for the farmer, the production of hybrid maize seed for a particular district is a costly process and profitable commercial production of seed accordingly will depend upon a large and regular demand by district growers and preparedness to pay the necessary price.

The new linseed industry is still making progress. It is estimated that just under 50,000 acres were planted for harvest this season, although a proportion has been damaged by frosts and cutworms. Linseed was first planted on a commercial scale only in 1947, when approximately 130 acres were harvested.

FRUIT AND VEGETABLES.

The horticultural industries had a rather mixed year. Drought, frost and hail all caused serious losses to fruit and vegetable growers. In some areas in which irrigation water normally precludes drought losses, failure or inadequacy of underground and stream water was responsible for lowered production.

Frosts during 1951 caused extensive damage to pineapple plantations and the crop was inadequate to meet the demands of the fresh-fruit market and canneries. In addition, planting material was insufficient for the new season's projected plantings.

The establishment of a cannery in the Rockhampton district by the C.O.D. offers an incentive to increased production of pineapples and papaws in the Central district, just as the Great Northern Co-operative Cannery does in the north. A chain of processing plants operating along the coast will do much to overcome the disability of limited avenues of output which has prevented the expansion of fruit-growing in some districts in the past.

Hail damage to apples threatened Granite Belt growers with a disastrous season. However, most of the affected fruit was not badly damaged, and in view of the circumstances the Department permitted a quantity of hail-marked apples to be placed on the local market.

Vegetable prices fluctuated widely during the year in accordance with shortages and heavy supplies due to varied weather conditions. The average margin of profit is worrying many small-crop farmers, who claim that in 1951-52 their limited sales at high prices were not sufficient to compensate for the low prices received during periods of over-supply. The industry, through the Vegetable Sectional Group of the C.O.D., is exploring various means of improving its position.

At each glut period the question of the value of processing surplus vegetables to relieve the price position for the grower and to prevent waste of foodstuffs is raised. This matter bristles with difficulties. The operation of a vegetable line at a cannery might well be unprofitable if produce were available only at unpredictable glut periods. Further, much of the surplus would be unsuitable for processing, in which a high quality, uniform raw product is essential. Again, the ready availability of locally processed vegetables might keep down the price on the vegetable market in times of shortage.

Marketing of fresh produce is a somewhat complex operation, and producers, traders, and consumers find it of very great advantage to have comprehensive and dependable information supplied by an unbiassed agency, represented by the Department's Market Price Reporting Service. This service has been operating for several years, reporting each market day on operations in the fruit and vegetable and farm produce markets. The daily reports cover prices, volume, quality and anticipated movements, and a weekly summary is issued. The market news information collected by the Department is disseminated to interested persons by radio, newspapers, and direct mailing. It enables producers and country buyers to keep in touch with the state of the market, and is used as the official guide in the case of disputes between certain parties.

SOIL CONSERVATION.

During the past few years a gratifying amount of work has been carried out in devising and demonstrating suitable methods of erosion prevention and land reclamation in various districts. Some 900 farmers have asked for Departmental assistance in planning the protection of land from the further effects of soil erosion, and conservation work has been completed or begun on several hundred properties. The factor limiting the speed with which this urgent work is being done is the availability of trained staff.

It has been found that many farms can be dealt with as units. They are not receiving high volumes of water from adjoining properties nor discharging their surplus on to other farm lands. In some cases where a conservation plan must cover two or more farms before it can be effective, the farmers concerned have come to a satisfactory arrangement. But sometimes it happens that one or two farmers in an area who are genuinely concerned with soil conservation find that they cannot put an effective plan into operation because neighbours whose co-operation is essential refuse to come into the plan.

The Soil Conservation Act of 1951 was designed to meet this situation as well as to co-ordinate the activities of the various public authorities directly or indirectly concerned with or in soil conservation work. The Advisory Committee constituted of representatives of the Departments of Agriculture and Stock, Irrigation and Water Supply, Main Roads, and Local Government has functioned since the proclamation of the Act; it has considered applications for two area projects involving 5,000 and 7,000 acres respectively, and has made recommendations on these projects and various other matters.

The essential feature of the Act is that power is given to the Minister to require persons and bodies to take action to preserve land from erosion or to restore eroded land. The Minister may order an inspection or survey of an area which might be a soil erosion hazard, either on his own initiative or on the requisition of three-fifths of the landowners in any specified area. If after investigation the area is declared a soil erosion hazard, landowners may be directed to adopt certain land-use practices, and State and local authorities may be required to co-operate in carrying out the soil erosion prevention work. The right of appeal is given to the persons and bodies affected by an order. Provision is also made for a determination by the Valuer-General as to the apportionment of costs between those concerned.

Largely as a result of Departmental advisory and demonstration work, the retention of crop residues on the surface as a mulch is now a well-established practice on the Darling Downs, and it is fairly extensively practised in the South Burnett. Sundercuts and tyned implements are used to effect retention of the stubble. In the Kingaroy district, some farmers establish a mulch of peanut shells, obtained from the peanut silos, and maintain the mulch by working the land with tyned implements only. On the Atherton Tableland, many farmers still practice stubble burning, but it is being discontinued by an increasing number of farmers.

FARM MECHANISATION.

The primary production targets set by the Australian Agricultural Council for Queensland will require the most effective use to be made of the State's farm and orchard lands. Implicit in this is an expansion of mechanisation of farming operations.

It is evident from a perusal of statistics collected by the Queensland Government Statistician that the last few years have seen a steady increase in mechanisation on farms. There were, for instance, 17,792 tractors on rural holdings in 1946-47, 20,761 in 1948-49, and 27,794 in 1950-51. The number of milking machine units rose from 36,866 in 1946-47 to 44,228 in 1950-51; it is estimated that in the above-10 cow herds about two-thirds of the cows are milked by machine. Orchard power sprays increased from 819 to 1,182; fruit graders from 785 to 867. Throughout practically the whole range of implements and machinery quite substantial increases in the number of units were recorded over the 4-year period. Such decreases as were recorded were usually compensated by increases in more effective units: Thus, the number of single-furrow ploughs fell but that of multiple-furrow ploughs rose; similarly a fall in cultivators was more than balanced by an increase in rotary hoes.

A survey conducted during the year by the Council of Agriculture at the request of the Department revealed that, despite the increases noted above, unless shortages of certain types of machinery and other equipment were relieved, expansion of food production would be seriously hampered. This position obtains in other States also, and presents a hurdle which will have to be cleared before the production targets can be reached.

The dollar position is, of course, responsible for many of the shortages, inasmuch as a large proportion of the equipment in demand comes mainly from the United States. Tractors imported to Australia in 1938-39 from the United States comprised 3,462 of the total of 3,689 imported, representing 94 per cent. In 1950-51, only 12½ per cent. of the tractors imported came from the United States. However, some of the 28,575 tractors imported from the United Kingdom in 1950-51 and many of the 3,920 tractors built in Australia in that year were American models manufactured under licence. There are well over a hundred different models of horticultural and agricultural tractors currently available in Queensland.

The statistical returns for 1950-51 showed that there were more than 12,000 mowers on rural holdings in Queensland. As there were less than 42,000 holdings in the State, and many thousands of these would have no call for a mower at all, it would appear that quite a high proportion of the properties on which hay could be made have a mowing machine. Yet only 45,000 acres of crop were cut for hay—less than four acres per machine; and hay and chaff stocks on farms at the end of March, 1951—the beginning of the disastrous drought—were only 102,000 tons, or 8½ tons per mowing machine.

Fertilizer distributors recorded as being used on farms in 1950-51 numbered 6,618. The total area fertilized by machine and hand was 323,614 acres, but less than 3,000 acres of this was pasture land.

Mechanisation has done a great deal to relieve drudgery and back-breaking toil on the land. Its effect lies in this direction rather than in displacing units of labour. While fewer men are actually engaged in the field operations there is a vast army of men in cities, towns and townships engaged in building the machines, repairing and servicing them, and supply fuel and oil; in other words, machines effect a transfer of labour.

DRY-FARMING STUDIES.

The erratic nature of the rainfall in the agricultural districts experiencing average annual rainfall of between 20 and 60 inches dictates the pattern of successful farming in those districts. The farmer who relies on planting rains plus rainfall during the growing period of his crop to return him a profitable yield is often disappointed, particularly if he is attempting to grow a crop during months that are normally dry.

The paradox of wheat, a winter-grown crop, being regularly grown on about one-third of the cropped land in Queensland, which experiences a predominantly summer rainfall, is explained by farming methods that ensure the storage in the subsoil of summer rainfall which can be utilised by an autumn- or winter-sown crop. Such methods were established many years ago and have stood the test of time. In fact, crops of over 30 bushels per acre have been harvested from stands that received no effective rainfall subsequent to sowing.

Departmental investigations of the water requirements of crops have been directed also to summer-growing crops, particularly cotton and grain sorghum. The object in each case is to determine, for each major district and soil type, at what periods of development of the crop stress conditions are likely to lower the potential yield; to ascertain to what extent the subsoil moisture at planting time can be relied upon to eliminate or shorten the periods of stress; and to devise cropping systems which on the average will ensure the best possible return from the rainfall. Determinations such as these will have particular usefulness in the extension of agriculture in and beyond what are now marginal districts.

Some crops are much more economical of water than others. Sudan grass, for instance, will yield a ton of hay for a water uptake only approximately half that required to produce a ton of lucerne hay. This is generally realised by farmers, but it is not so widely understood that as the fertility of the soil increases so does the water requirement if the crop is to realise its potential. This has particular significance where fallowing is practised, as fallowing tends to build up the nitrate supply in the soil and the growth of the succeeding crop is likely to be stimulated by the high nitrate level and so require more moisture. Fallowing practices should accordingly take into account the extra storage of water required.

Queensland agriculture has too long been dominated by the traditional practices of Western Europe, where soil and atmospheric moisture conditions are so vastly different. It is hoped gradually to build up an agronomic research section within the organisation of the Regional Experiment Stations in order to investigate the important problems of moisture penetration and conservation.

BRIGALOW COUNTRY.

Without question the "brigalow belt" offers quite the best prospects for the development of new closer settlement in Queensland. Brigalow (*Acacia harpophylla*) in pure stand and in association with belah (*Casuarina lepidophloia*) and other timbers, occupies much of the most fertile agricultural soil of this State; moreover a goodly proportion of this area has a reasonably good winter rainfall component.

A broad survey of the extent of brigalow forest in Queensland, and of the degree to which the area under this type of vegetation has been reclaimed for primary production, has been made by the Bureau of Investigation. Roughly, some 23 million acres are still under brigalow. On many millions of acres there has been no attempt to thin out or destroy the brigalow stands, and the bulk of the remainder is poorly developed for grazing or agriculture. The standard methods of ringbarking, or ringbarking and poisoning, followed by firing after an appropriate interval are not being employed on a wholesale scale because of the shortage of labour, the high cost of initial treatment, and often the necessity for re-treatment. Obviously, some more economical and more reliable method of destroying brigalow must be devised if a vast province of fertile country which was rescued from prickly pear 20 years ago is not to remain in an even more tenacious grip.

The Department has watched with considerable interest and made observations on the progress of an aerial spraying venture on "Cypress Downs," in the Maranoa, where some 20 acres of virgin brigalow and brigalow suckers were sprayed with 2,4-D/2,4,5-T in April, 1951. It was hoped that conditions favourable for the absorption and translocation of the herbicide would follow spraying in order to indicate quickly whether or not success could be attained in favourable circumstances. Unfortunately, a long period of drought followed, and though many of the trees were severely injured by spraying, their ultimate fate is still unknown and is not likely to be determined for some months yet. Arrangements have also been made for Mr. S. L. Everist, during his visit to the United States to attend the International Grasslands Congress, to make a study of the destruction of mesquite stands by aerial spraying.

OVERSEAS VISITS.

The practice of sending officers overseas, on specific missions or to receive advanced training, has been continued. The writer, who visited England late in 1951 as a member of the Australian delegation to a British Commonwealth sugar conference, was afforded the opportunity of examining aspects of agriculture in Great Britain and Western Europe, and of spending some time in the United States and Hawaii on the return journey. Particular attention was paid to livestock production and dairying.

In these days of rapid aerial transport the danger of introducing new animal diseases is correspondingly increased and common prudence demands first-hand knowledge. Mr. L. G. Newton (Officer in Charge, Oonoonba Animal Health Station) has spent several months in various African countries studying pests and diseases of livestock and their control. In view of the very serious danger of foot and mouth disease being introduced to Australia from one of the many currently affected countries, the Government approved that Mr. Newton study this disease in Great Britain and on the continent. While in Europe Mr. Newton will also secure information on pig progeny-testing stations in Denmark.

The Director of Sheep Husbandry (Mr. G. R. Moule) obtained a study fellowship under a "Leader and Specialist Grant" of the U.S. Government and left for America in June to examine extension methods in the primary industries. The State Government has made funds available to enable Mr. Moule's tour to be extended.

A tour extension grant has also been made to Mr. S. L. Everist (Botanist) to enable him to visit Europe after attending the International Grasslands Congress in the U.S.A. as a Commonwealth delegate.

The Department gave special leave to Mr. K. Howard of the Cattle Husbandry Branch to enable him to proceed to Texas and return to Queensland with the first group of Santa Gertrudis bulls to be introduced to Australia.

ACKNOWLEDGEMENTS.

The Department wishes to acknowledge the assistance it has received from other State Departments and from Commonwealth Departments; the grants furnished by the Commonwealth Government for tobacco investigations and dairy extension services have been of great assistance. The Press and Radio services have been generous in their allocations of space and time for agricultural news. Producers' organisations officials have, as usual, been helpful and understanding.

R. Veitch.

The staff has worked well and senior officers, particularly, have had a strenuous year. Owing to my absence overseas, and membership on the Commonwealth Sugar Inquiry Committee and the Queensland-British Food Corporation Committee of Enquiry, I have spent very little of the period under review in office; Mr. Robert Veitch has had the onerous task of combining the duties of Under Secretary and Assistant Under Secretary (Technical).

Yours faithfully,

Under Secretary.

30th September, 1952.

DIVISIONAL DIRECTORS' SUMMARIES.

DIVISION OF PLANT INDUSTRY.

Director: Dr. W. A. T. Summerville.

If it could be said with confidence that the 1951-52 drought would long be remembered by the farmers of Queensland it would in some measure offset the regrets engendered by the disastrous season experienced in practically every agricultural and pastoral area in the State during the period under review. There are, however, little grounds for any such confidence, and the lesson of 1952 will in all probability be ignored just as completely as was that of 1946 by a great many of our farmers and pastoralists. It seems almost incredible that in 1951 many of our landholders were caught as unprepared as if this were the first drought the land had experienced in their time.

Admittedly, during the period of drought much was written and said about the folly of not using good seasons to provide some insurance against the rainless ones which all know will follow, but unfortunately the final conclusion of the majority is that it is a matter for some Government instrumentality. There are, however, two points which need to be realised. The first is that any positive Government action must carry some form of control or compulsion. The second is that in every other country which can lay valid claim to enlightenment, farmers, and particularly those engaged in any branch of animal husbandry, regard provision for periods of fodder scarcity as the normal routine of sound farming. The essential differences between Queensland and most other countries lie in the irregularity of incidence and duration of the drought period and the fact that in the absence of drought in this State it is possible for a proportion of primary producers to survive and perhaps even to flourish without needing to be efficient. The seasons from 1947 to 1950 were in the main very favourable and no doubt fostered a feeling of security, so past history and repeated warnings by responsible officers of this Department were very largely ignored.

From the technical agricultural point of view too, droughts, like so many other forms of adversity, have some virtues. One of these is that during the enforced rest of the soils there is a build-up of certain plant nutrients, and when moisture again becomes adequate the growth of many plants is extremely vigorous. This was strikingly illustrated this year, when following the breaking of the drought, the autumn and early winter months were characterised by phenomenal growth of many plants, notably pasture, cereals and vegetables. Unfortunately, one effect of this is that farmers by making quick recovery from a drought tend to forget that there will be another.

Nevertheless, the memories of the 1951-52 drought are still fresh in many minds and there appears at the moment to be a wider and firmer determination than formerly among stock-owners to make some preparations for future droughts. It is to be hoped that action follows.

In so far as the animal owner is concerned, the conservation of silage, grain and hay is the main method by which the productivity of the good season can be carried over to cover the poor one. Not all these forms of conservation are applicable in all areas, but at least one or other of them is practicable over most districts of the State other than the most arid regions.

It must be admitted that in certain branches of primary industry there is little that the individual farmer can do to offset prolonged drought. This applies particularly to fruit and vegetable production in areas with little or no irrigation water, and the answer there must lie to a great extent in the development of irrigation schemes. However, in the absence of irrigation the individual can at least so handle his soil as to ensure the maximum absorption and retention of soil moisture. In fruit and vegetable districts the judicious use of some of the many tons of sawdust now burnt as rubbish and the more general adoption of mulching practices would undoubtedly be advantageous in offsetting comparatively short rainless periods. Any tillage which breaks down the physical structure of the soil accentuates the effects of drought; anything that improves this structure mitigates the ill effects.

As an overall measure, however, the most important steps that Queensland graziers and farmers can take are the development of agriculture in relation to animal production and the development of animal production in relation to agriculture. This combination of plant and animal husbandry not only is the firmest basis on which permanence of both industries can be established in many parts of the State, but also it should prove to be an excellent stabilising force in both the economic and production spheres in almost all areas where the rainfall is normally adequate for the practice of agriculture. A recent authoritative calculation shows that on less than 2% of this region in Queensland has anything other than the barest essentials, such as clearing and ring-barking, been done to improve animal production. The association of animal production with improved pastures and fodder crops is essentially the basis of the soundest farming practice in other countries and should be much more commonly adopted in Queensland. The full development of this thesis is, however, apart from the present purpose, which is confined to advancing the idea that rotational farming can

be used as a potent offset to drought. In this form of husbandry the soil is used for more intensive production without the exploitation which leads to deterioration through erosion. Reserves of fodder can be produced to protect the animal, while the animal in turn can be used to ensure that poor crops, not economically worth bagging, can still give substantial return by conversion to meat, milk, or wool. The improvement in soil condition must be reflected in the pasture phase and thereby will be an offset to drought.

There is a large proportion of Queensland where agriculture is never likely to be sound, but even in these districts some effort can be made through the conservation of bush hay. Surplus pasture growth which is at present burnt from hundreds of square miles every year requires no special effort or expense to produce. Therefore, when properly conserved it is often the cheapest of the available supplementary fodders.

Formerly the development of some of these ideas could only have been wishful thinking, but with modern mechanical equipment such as tractors, allcrop harvesters, automatic pick-up balers and the like, coupled with improved knowledge of the technical requirements, it is largely a question of the will to do something. Attention may be directed to the recent accomplishment in the McKinlay area in the 15-inch rainfall belt. Here 10,000 bales of bush hay were taken from land yielding only 14 cwt. per acre. The whole operation involved only 77 hours' work. This suggests that the firestick is neither the only nor the best answer to pasture management, and further, that something positive might be done in the matter of drought-feeding.

The object of fodder conservation should not be merely preparation for unheralded droughts; it is needed every year in Queensland to maintain production over the spring and early summer months when pasture in most years can be expected to be poor and inadequate for good production.

In this connection, a crop which has not received the attention in coastal dairying areas which its value as a standing reserve fodder merits is cowcane. The demand for molasses and cane from sugarcane-growing districts in 1951 well illustrates this point. Cowcane is low in protein but it is a very useful nutritious and bulky fodder which has a great advantage in that it is capable of being stood over in the field for months if not affected by frosts. A good crop will provide 50 tons or more of green material per acre. In recent years the Department has given attention to the examination of suitable cowcane varieties. Care is necessary to ensure that varieties which might complicate the disease situation in the various sugar-cane-growing districts are not used. To date Co. 301 has proved to be an outstanding variety. It is very vigorous, provides a large tonnage of green material per acre, has a high survival value in dry weather, and is resistant to diseases which affect sugar-cane.

Silo-building equipment was again made available to farmers free of charge by the Department. Roofing iron and reinforcements were supplied at cost price. During the year five concrete pit silos and two concrete tower silos were completed under Departmental supervision, while arrangements are in hand for a further 18 tower silos. The difficulty of obtaining cement has been a deterrent in some cases, but it cannot be denied that these totals are lamentably small.

PASTURE INVESTIGATIONS.

More and more emphasis is being placed by the Division on pasture work. This needs no further justification than the fact that more than 40% of the income of the State is derived from pastures. A measure of the amount of work in hand may be taken from the fact that there are now 86 pasture experiment plots scattered throughout the better-rainfall areas of the State from the New South Wales border to the Atherton Tableland. This number would have been larger but that the drought precluded the successful initiation of work in several other instances.

With respect to studies on species, it is evident that green panic and buffel grasses are more drought-resistant than is Rhodes grass and it seems certain that these two species will fill an increasingly important role in our pastures in the 20–30-inch rainfall belt. Buffel grass is also proving valuable in the 15-20-inch zone of north-western Queensland. Rhodes grass, however, will continue to be of first importance in many areas.

The nutritional requirements of grasses and fodder plants generally has been and will continue to be the subject of intensive study. As basic knowledge develops it is becoming obvious that rather too much stress has been placed on the grasses themselves and not enough on the soil and other environmental requirements.

In this connection the so-called wallum country bordering the coast southwards from Rockhampton to the Tweed is to be the subject of intensive work on plant nutrition, with special reference to production of pastures and fodder plants, and through these of animal products, particularly milk. Laboratory studies and small-plot work have given grounds for hoping that the productive capacity of this large stretch of country can be increased enormously. The problems are by no means solved—in fact, it might more correctly be said that they are little more than defined—but sufficient has been elucidated to suggest that the deficiency of a number of plant foods can be economically made good. If an economic answer is forthcoming, then drainage could transform many thousands of acres of now almost worthless country into a really worthwhile region well served by roads and railways, enjoying probably the most reliable well-distributed rainfall in the State, and well situated geographically with respect to centres of population and ports. The acquisition of a small area near Brisbane for field-laboratory requirements and a larger area near

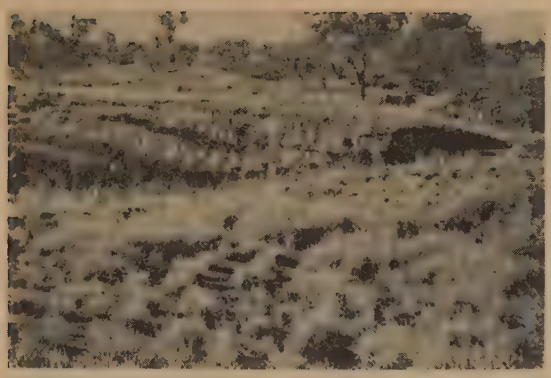


Plate 1.—Buffel Grass on Broken Spinifex Country in the Cloncurry District.

Plate 2.—A Strain of Buffel Grass at Biloela Regional Experiment Station.

Plate 3.—Irrigated Pastures on the Burdekin. Para grass and Centro on left; Guinea grass and Stylo on right.

Plate 4.—Portion of a Wheat Varietal Trial on the Darling Downs.

Plate 5.—A Cotton Crop Yielding 2,000 lb. Seed Cotton per Acre at Ayr Regional Experiment Station on the Burdekin.

Plate 6.—A Multiplication Area of Pedigreed Seed of Alpha Grain Sorghum, a Popular Queensland-bred Variety, at Biloela Regional Experiment Station.

Plate 7.—Testing an Experimental Ribboning Machine on Fibre Crops Grown at the Bureau of Tropical Agriculture, South Johnstone. Pink burr crop on the left; jute crop on the right.

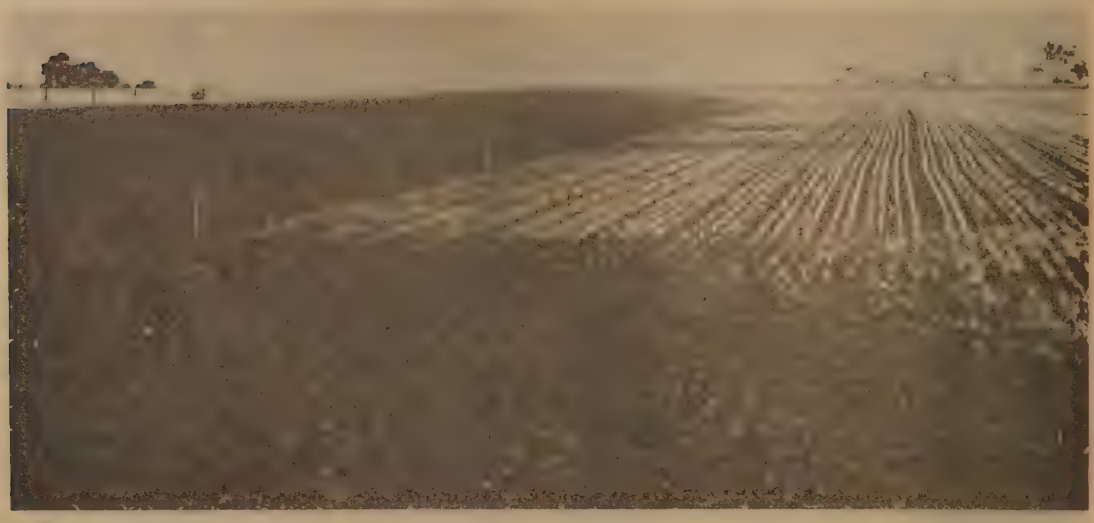


Plate 8.—Portion of a Cutworm Control Experiment on an Oat Crop, Showing Protection Afforded by DDT Spraying.

Plate 9.—A crop of Advance Sunflower at Ayr Regional Experiment Station.

Plate 10. A Canefield Planted on the Contour to Minimise Soil Erosion Losses.

Plate 11.—Young Citrus Trees Propagated from Budwood and Seed Supplied to Nurserymen under the Department's Citrus Budwood and Seed Distribution Scheme.

Plate 12.—A Dam at Maroochy Horticultural Experiment Station.

Coolum for field investigations has provided opportunity for commencing work on basic questions.

A working agreement between the Australian Meat Board, C.S.I.R.O. and the Department has now been completed, whereby the Board has provided the facilities for the initiation of investigations on the improvement of beef cattle production. The Board has provided funds for the purchase of two properties for this purpose. One of these, situated in the vicinity of Gayndah and known as "Brian Pastures", will be mainly the responsibility of this Department. On this property, while many aspects of production may be investigated as opportunity presents itself, emphasis will be placed on animal nutrition through improved pastures and pasture management. Preliminary planning and selection of suitable sites and staffing arrangements have required much time and close attention, and it is pleasing to report that it is anticipated that active work will commence within a few months.

Agrostological work is a feature of the investigations also at the Bureau of Tropical Agriculture. This is reported upon elsewhere in the report of the Agriculture Branch, and from that account it will be seen that substantial progress has been made.

An overall survey leads to the conclusion that the farmers of Queensland are more than ever before interested in pasture improvement, and officers engaged in this work meet with ready co-operation throughout their territories. It is unfortunate that recognition of the fact that subdivision is an inescapable requirement of better pasture management comes at a time of shortage of fencing materials, particularly reasonably priced wire.

BURDEKIN RIVER INVESTIGATIONS.

The Division of Plant Industry is engaged on investigational work on irrigation farming in many districts. Apart from normal Departmental research and advisory work, special effort is being concentrated on the Burdekin River developmental area. In this work close contact is being maintained with the Burdekin River Authority and the Bureau of Investigation. The former body is financing the exploratory work on the flood-plain soils. This exploratory work is regarded as one of the most important single projects which the Division is handling. The results to date have been most encouraging and demonstrate beyond doubt that even the heaviest of the flood-plain soils so far examined have a highly satisfactory agricultural potential. A wide range of crops and pasture species has been successfully established, and the evidence so far accumulated shows that with irrigation and external drainage this region can successfully produce many crops and nutritious pastures. Temperate-climate clovers, such as Irrigation White and strawberry, have persisted through a very testing summer. In all probability, however, well-balanced mixed pastures of tropical species, such as Para grass and Guinea grass and the legumes Centrosema and Stylosanthes, will eventually dominate the valley floor of some 300,000 acres and thus make a very significant contribution in stabilising increased animal production in Queensland. Nevertheless, it cannot be overlooked that the crops of oats, wheat, sugar-cane, sunflower and grain sorghum which have been grown under the crude agricultural conditions at present obtaining indicate that if crop production is wanted it can be satisfactorily achieved.

The work in the Burdekin has called for a balanced team of technical officers, and within the area on the Regional Experiment Station at Ayr, on the Tobacco Experiment Farm and pilot plots at Clare, and in the undeveloped areas further upstream, the Division now has workers in agronomy, agrostology, entomology, soils chemistry and survey, and soil physics. It can be fairly claimed that the agricultural scientists are making a very substantial contribution towards the basic data essential for the sound planning of such a venture.

GENERAL INVESTIGATIONAL WORK.

The compass of this work being prosecuted by the Division may be gauged from the fact that apart from those concerned with pasture plants some 234 projects, embracing 35 crop species, are in hand. The investigations embrace a wide range of agricultural sciences, with special emphasis on plant improvement through breeding and selection, soil management, and pest and disease control.

Perusal of the reports by heads of Branches discloses that in all fields advances have been made, though drought conditions militated against complete success in many instances.

Cereals.

The registration and liberation of a new hybrid wheat under the name of Spica represents the most important achievement in the field of cereals work during the year. This variety has been subject to the usual rigorous tests and its performances justify the hope that a very worthwhile contribution to this industry has once more been made by our plant breeders. Spica has given high yields of grain of good gluten strength and has shown excellent stem-rust-resistant properties.

The study of wheat mottling has been continued, but apart from the possible implication of nitrogen, little definite further information can yet be given.

Oat varietal testing and breeding has also been advanced. The more general use of oats for winter feed is most pleasing, and it is evident that the search for better varieties, particularly those resistant to the new and more virulent forms of crown rust, is to be regarded as very important work.

Maize, linseed and grain sorghum have all received attention, and with respect to the last-named attention is directed to the fact that the Department-bred variety Alpha is becoming more and more popular. It is now a major variety in all the more important sorghum areas and is performing at least as well as any other variety.

Cereal crops, particularly wheat and grain sorghum, have been used extensively on Regional Experiment Stations as indicator plants in soil

management studies. The results of these studies, while directly referable to the particular species involved, have a much wider implication in that they throw light on the basic problems of the dryland-farming districts. It cannot be too strongly emphasised that in Queensland, more than in most other countries, the trapping and storing of water in the soil is the key to profitable cropping. Water penetration and retention studies therefore assume a very prominent place in the agronomic work of the Division, linking as they do crop production, pasture establishment and maintenance, and soil conservation

Cotton.

There is evidence that farmers are again becoming interested in cotton production and that but for the drought an appreciable increase in area under this crop would have eventuated in the past season. Even under the poor conditions of 1951-52, crops in the larger producing centres under irrigation averaged over 1,000 lb. on the first pick, with a small second pick in sight. Mechanical harvesting is proving its worth and there are many reasons, from the point of view both of direct return and of sound farming practice, for cotton to be included in the rotational programme in the 25-30-inch rainfall belt. One important point confirmed during the year is the necessity of planting at the correct time in the Burdekin. Yields exceeding 2,000 lb. per acre were obtained at Ayr Regional Experiment Station from timely plantings.

Fibre Plants.

It has now been shown that a number of fibre plants can be successfully grown in Queensland and it is clear that the establishment of a sound industry depends almost wholly on the development of mechanical means of recovery of the fibre. In the absence of success in that phase there seems to be no prospect of any further economic development.

Tobacco.

Many phases of tobacco work have received attention, the work being carried out principally on the Tobacco Experiment Farms at Mareeba and Clare. From long-term consideration, probably the most important investigations are those concerned with the development of suitable crop rotations. In too many instances references are made to "tobacco" farms. Departmental evidence shows that the monoculture of tobacco has no permanence as an economic agricultural operation. Insistence must be placed on the inclusion of other crops in the normal farming practice of tobacco-growers. This is the basis of sound tobacco production and it is fully recognised in the design of farm units in all settlement schemes. The report of the Agriculture Branch shows that there are marked effects in tobacco following other crops and in this regard the value of cotton in the rotation is worthy of note.

During the past season insect pests caused more than usual trouble and entomologists carried out investigations of control of several of the more important of these pests with satisfactory results. The good results obtained with dieldrin, a new insecticide, may be specially cited. Of particular note, too, is the information gained concerning the ill effects on the plant of certain insecticides, and it is recorded that BHC, chlordane and toxaphene should not be used in Queensland tobacco fields owing to the taint that these materials may give to the leaf.

Pineapples.

A comprehensive programme of investigations of pineapple problems is being conducted by the Horticulture, Science and Chemical Laboratory Branches. Practically all aspects of the production of this crop, including plant selection, disease control, soil management, weed control and problems arising out of marketing, are covered.

Weed control by hand-hoeing on the steep hillsides on which pineapples are commonly grown in Near North Coast areas is a time-consuming and costly operation and the work on weed control is therefore of great importance. The use of sodium pentachlorphenate as a pre-germination weedicide is now widespread and will no doubt provide a means of reducing production costs.

The practice of mass selection for improvement of plant type is perhaps the most potent single factor now in the hands of the growers for the betterment of the industry. A stable industry, particularly one dependent so largely on selling the processed article on overseas markets, rests largely on standardisation on a high plane, and this must be based on a good-quality fresh fruit. Growers are alive to this, but as first-class planting material is still short of the demand there is still much inferior material used. Every effort to eliminate poor-class plants is worth while, and Departmental officers are using every opportunity to have growers take full advantage of the results of the Departmental research on this matter.

Papaws.

In a year when virtually all fruit and vegetable crops were very badly affected by adverse seasonal conditions, papaws were probably the most affected. The incidence of virus disease was particularly heavy and losses of up to 80% of trees were reported. The problem of control of papaw dieback is most complex and it cannot be claimed that any real progress has been made during the year. The main line of attack has been by attempting to breed resistant varieties and this probably still offers the best possibilities, though no success can yet be claimed. The plant breeders' efforts have resulted in the production of improved fruit strains, but unless the virus can be checked the outlook for the industry is not bright. The provision of a glasshouse, which it is anticipated will eventuate within the next few months, will give the pathologist a much better chance of solving the problem by permitting more intensive studies under controlled conditions.

With papaws, as with a number of other tropical species, the Horticulture Branch is giving an increasing amount of attention to problems arising out of marketing, and as will be seen from the report of that Branch, work on maturation, canning, quick-freezing, general processing and preservation is developing as fast as facilities permit. The acquisition of a new deep-freezing unit will materially assist this research.

Vegetables.

All major vegetable crops have been the subjects of investigation during the year, and attention may be directed to the varietal improvement work in tomato, bean, carrot and cauliflower.

Both field and laboratory investigations have been undertaken on the potato, and several Branches have been engaged in efforts to improve the production and marketing of this crop. Extensive variety trials, the practicability of improving seed supplies by the use of spring-crop tubers for North Queensland plantings, and tuber storage work are the outstanding points on which investigations have been proceeding. In connection with the last-mentioned activity, it is noteworthy that commercial lots of mature tubers were stored with only very slight loss in weight or from wastage when kept at 45°F. It should be noted that with immature potatoes the loss though small was nine times as great as with mature ones stored under otherwise similar conditions.

EXTENSION WORK.

The communication of the results of experiments emanating from either local research workers or external sources has always been, and of necessity will continue to be, a most important activity of the Division of Plant Industry. An endeavour is made to use all available facilities for placing before farmers the most up-to-date information. The chief means are personal visits to farms, the holding of field days on experiment farms and plots, publication in the Departmental journal and the press, the conduct of special schools, and the use of films.

The attitude of pineapple-growers with respect to keeping abreast of developments is most gratifying and exemplary. Schools for junior pineapple-growers have met with unqualified success and this is pleasing. More pleasing still, however, and to a degree unexpected, is the popularity of adult schools. It is most significant that a school for adult pineapple-growers was attended by nearly 100 well-established growers from the surrounding districts. The instruction is given by Departmental specialists and the organisation is largely done by the C.O.D. Much credit is due to that body for its important part.

Field days on experiment and demonstration areas have been well attended, and in this way in the course of each year some thousands of farmers throughout the main agricultural areas are brought into close contact with the work of the Department. These days are becoming more and more popular and in the past year it was not possible to accede to all the requests for such meetings. No requests are refused if it is at all practicable to make officers available, for the staff is appreciative of the opportunity of making professional contact with interested persons. The attendance is usually in the vicinity of 40 for ordinary field days, while on particular occasions up to 800 have attended. The smaller number is preferred as more personal contact can then be made.

Increasing use is also being made of radio; 12 broadcasts were given by officers from National stations and material for other items supplied to commercial stations. The enquiries following these broadcasts are numerous and may be taken as a criterion of the usefulness of this method of disseminating information.

SOIL CONSERVATION.

The passage of the Soil Conservation Act of 1951 has made it practicable for the various interested bodies, such as the Department of Main Roads, local authorities, the Irrigation and Water Supply Commission, and the Department of Agriculture and Stock, to make joint, co-ordinated plans on soil conservation projects. This is a very important matter, for in many cases the only satisfactory method of handling an erosion problem is on a whole-catchment basis, yet at the same time it is necessary to take full cognisance of all the influencing factors such as main roads, local authority drainage, and general public and private interests. It is believed that this legislation will effect considerable improvement in the overall situation without in any way prejudicing the individual farmer's position.

From the report of the Agriculture Branch it will be noted that active interest in conservation is increasing, and indeed the amount of work being brought to the Department is embarrassing to the rather small staff. This staff is, however, being increased as quickly as practicable.

TECHNICAL CONFERENCES.

During the year two staff regional conferences have been held, one at Brisbane for officers serving coastal districts south of Gympie, and one at Ayr for officers whose territories lie in the drier tropical coastal region. These conferences served to ensure a free interchange of information and ideas between individual workers and also to allow administrative officers to detect where any weaknesses in the general attack on problems may lie. Both conferences served their purpose very well.

Divisional officers have attended interstate technical conferences with officers of other State Departments and C.S.I.R.O. when appropriate. These technical conferences have covered the fields of agronomy, with special reference to phosphatic fertilizers, plant breeding (cereals), agrostology, plant quarantine and entomology. The interchange of information between specialist officers has been of very considerable value.

Collaboration with C.S.I.R.O., particularly so far as pasture work is concerned, has been maintained and as a result of steps to be taken in the near future will, it is believed, be greatly improved.

Through the Bureau of Investigation and the University of Queensland there has been set up machinery for co-ordination of all soils work. This has been valuable in ensuring that overlapping is reduced, that the latest technical advances are available to all workers, and that

any particular problem is correctly placed in order of priority to each government organisation concerned. In times when War Service Land Settlement schemes and irrigation projects are being determined this is most important, for, in the ultimate, it is the soil which will largely dictate the fate of most of these plans.

STAFF.

Although there have been changes involving a considerable number of officers during the past 12 months, the staff position has remained much more stable than for some years past and only one resignation of a highly qualified officer was received. Unfortunately, two such officers died. Both of these men, Mr. B. W. Butler and Mr. J. B. Harrington, were doing very good work, and their untimely deaths are recorded with both personal and official regrets.

A total of 15 new technical officers was appointed, the benefiting services being agrostology, horticulture, entomology, agricultural chemistry, field advisory services, and regional experiment stations.

The services of the Division are now reasonably well balanced, except that the call for soils technologists is greatly in excess of the personnel available. The total strength of the Division is now approaching a figure that was estimated a few years ago as being necessary to provide the service demanded by farmers. However, the call for technical assistance is continually expanding and there is no doubt that if qualified men were available a further 10% increase in overall strength could be gainfully employed immediately.

The present is essentially a developmental period in agriculture in Queensland, and the formulation and execution of comprehensive plans make a very heavy call on the time of those officers whose essential duties are those of co-ordination. In order to cope with the increased work thus falling on the Director, it has been found necessary to provide a Technical Administrative Officer. This position, assigned to Mr. J. A Weddell (formerly Assistant Senior Entomologist), has been found a most useful one and has undoubtedly increased efficiency in several directions.

DIVISION OF ANIMAL INDUSTRY.

Director: Mr. W. Webster.

The serious drought experienced during 1951 and in the north-western portion of the State during 1952 to date affected production in all animal industries in Queensland, and it will be years before recovery in the beef and sheep industries can fully take place. Recovery from the 1946 drought was accelerated by the bounteous season of 1950, which from climatological records was the outstanding year of the century to date. As a result of the lush growth in that year, followed by the sudden onset of dry conditions in 1951, the quality of the pastures at the beginning of the year under review was poor and stock virtually starved when surrounded by plenty of roughage. In addition, there were serious grass fires. This state of affairs, associated with the intense heat and lack of water, caused a serious loss of calves and breeders, the results of which will be felt for years to come.

The failure of the monsoonal rains was partly balanced in some districts by late-summer and autumn rains. These, however, were not sufficient to replenish surface water and even in these areas losses could still be serious. The complete lack of rain in parts of the north-west and the Barkly Tableland has prevented the movement of cattle from the Northern Territory during the 1952 cattle season to date. With the exception of those on some properties reasonably close to the railhead, cattle which normally would have travelled into Queensland for the most part have had to be left to die on their home runs.

The past year has shown the need for improvement of northern Queensland stock routes which in dry periods become impassable. Many of these routes depend more or less entirely on natural storage of water, which frequently cuts out before the droving season is completed. This year some of the routes were almost untrafficable from the very beginning of the cattle season. The drought year has also shown how badly a railway from the Barkly Tableland to the Great Northern Line is required. Tens of thousands of cattle could have been saved if a railway link even as far as Camooweal had been in existence and adequate rolling-stock available.

Added to the difficulties encountered as a result of the adverse season has been the continued presence of cattle ticks far south of the normal tick line and the occurrence of tick fever in some of the travelling mobs. It is indeed fortunate that medicaments other than arsenic have been available for dealing with ticks, as losses would have been very heavy had it been necessary to dip starving, overdriven cattle in arsenic solutions, the more so if the ticks should have proved to be arsenic-resistant and repeated treatments therefore necessary.

The drought has accelerated the drop in sheep numbers, and because of the two serious problems of infertility and lamb mortality there seems little likelihood of rebuilding the State's flocks to normal strength in the next few years, unless these problems are satisfactorily solved and good seasons prevail.

Shortage of feed grains has caused a drop of some 20% in production in the pig industry. The increased local prices of pigmeat should, however, help to encourage greater production, especially as heavy grain sorghum yields in some districts seem assured. Although the industry considers that the British Government contract export price is low, the demand for shoulders and hams for canning for sale on a trader-to-trader basis keeps returns up. For years now it has been obvious that a sound pig industry can only be developed in areas where fodder is produced and cannot be dependent upon grain surplus to requirements in some other connection or accompanied by subsidy. The marketing of grain as pigmeat seems to be the only sound approach to the problem. The increased need for wholemilk for human consumption, both directly and in the form of manufactured goods, accompanied by a decrease in butter production, has been part of a world-wide pattern now revealing itself in Australia. Unless the pig farmer is prepared to develop his industry with home-grown fodders, production must continue to be unstable and dependent upon surpluses or subsidies.

No animal industry has been more seriously affected by drought than the poultry industry. Depending entirely as it does upon the availability of grain, it was during the past year faced with a fodder shortage caused by drought and accentuated by grain export commitments. This shortage was serious and caused most farmers to reduce flocks. Valuable laying stock were sent to the abattoirs in large numbers. At the same time, the sudden drop in the price of export poultry meat caused serious monetary loss, and the poultry farmer is now loth to expand, firstly because of the uncertainty of fodder supplies and secondly because he considers the marketing position is unstable. It can, however, be stated that at the present price for eggs on the local market and current feed costs, production should increase. Such production, however, would only be profitable when placed on the local market and over-production in the summer and shortage in the winter could again occur. In the meantime, while there are signs of recovery in the industry, hatcheries are reporting greatly reduced orders for day-old chicks, which must mean reduced egg production.

DEVELOPMENT OF THE DIVISION.

While the drought and its results have seriously affected the work of the Division as a whole, good progress has been made in some directions. In 1943, following an investigation of Departmental activities, a report containing

many sound recommendations for re-organisation and development of the Department of Agriculture and Stock was made. Upon adoption of these recommendations, it was possible to make some changes quickly, but others have necessarily been somewhat slower in coming into effect. The important early change was the welding of the many branches into five Divisions, among these being the Division of Animal Industry. The formation of this Division is in line with similar developments in other States and countries where comparable changes have been made. It is also in line with the newer conception of veterinary science, which has been in the process of changing from a science dealing only with the treatment of animal disease to a science which includes disease prevention through improved husbandry. For maximum production in the animal industries, disease control and husbandry extension work must be co-ordinated under the one direction, for the two subjects are so closely related that staff must work in complete collaboration.

Since the reorganisation much has been accomplished. A Cattle Husbandry Branch has been created to assist the beef and dairying industries to increase production. All other Branches have been expanded and staff have been stationed in parts of the State where no direct assistance to producers had been given previously. Due consideration has been given to good husbandry in its broadest sense and there is close co-operation with the Division of Plant Industry in an endeavour to relate animal production to crop husbandry. On the whole, 1951-52 can be counted a year in which much progress was made towards the complete pattern envisaged in the recommended reorganisation.

Realising that husbandry experiments and demonstrations must be stepped up, it was decided to extend the scope of Yeerongpilly Animal Health Station, where mainly disease investigations had been previously undertaken. In June, 1952, an area at Rocklea of approximately 350 acres was taken over. This area is quite close to Yeerongpilly Animal Health Station and can be run with it as one unit. It will now be possible to devote Yeerongpilly to disease investigations and Rocklea very largely to husbandry investigations. Cattle nutrition studies, including calf-rearing, will be carried out as part of the investigations to be developed in the wider field on other properties. The larger area of land will allow development of work with mineral and trace-element deficiencies at present being investigated by a team of workers of the Divisions of Plant Industry and Animal Industry. On the land at Rocklea will be erected a pig-testing station to be made available to the industry for measuring the capabilities of boars in a practical system of progeny testing. An examination of the construction, layout and working of these stations is to be carried out by a veterinary officer of this Division who will shortly be in Denmark, where these stations have been evolved and successfully run. It is also intended to construct a poultry farm on which disease and husbandry investigations will be undertaken.

During the period under review the sheep experiment station at Toorak, near Julia Creek, was developed in a comparatively short space of time. Various buildings have been renovated or erected and the station is ready for full-scale work when seasonal conditions return to normal. This quick development reflects great credit on all the staff concerned, particularly the Director of Sheep Husbandry and the Manager of the station.

In June the property known as "Brian Pastures," situated near Gayndah, and earlier in the year "Belmont," in the Rockhampton district, were taken over by the Australian Meat Board and will in due course be made available to the Department of Agriculture and Stock and C.S.I.R.O. for research to assist the beef industry. On the former, pasture work will be the main project and on the latter breeding-work.

VETERINARY PRACTITIONERS AND TUBERCULOSIS CONTROL.

During the year the Department's scheme for the eradication of tuberculosis was expanded considerably. Development is based on careful planning and areas have only been brought into the scheme following the establishment of qualified veterinary practitioners in the district. Commencing as a scheme designed to submit to the tuberculin test cattle from which wholemilk was supplied to the city of Brisbane, it has now been extended to include all cattle in the South Coast, Brisbane and Darling Downs areas, cattle from which milk is supplied to Townsville, and cattle from which cream is supplied to the Kingaroy, Gympie, Bundaberg and Rockhampton butter factories. The incidence of tuberculosis found in the Brisbane and South Coast areas in the early stages of the scheme in 1945-46 was approximately 12.5 per cent.; this has been reduced to 0.64 per cent. When the scheme was commenced there were only three qualified veterinary practitioners available for employment under contract to the Department on this work. Now there are 22 in practice in the various parts of the State who are participating, nine additional veterinary surgeons (seven in country districts) having commenced practice during the past year. As a system of disease control the scheme has been highly successful, but in addition it has attracted qualified veterinarians to the country districts of Queensland to be available for all types of veterinary work. Men are now stationed in practice in areas stretching from the Atherton Tableland down the Queensland coast, through the Brisbane area, and out onto the Darling Downs. It is confidently expected that in a very few years this number will be more than doubled. The establishment of veterinary practitioners in country districts has had an important secondary effect in that Departmental veterinary officers have been relieved of much routine work. These officers thus become available for special investigational work and extension work in the true sense of the term.

STAFF.

Good progress was made with staffing the Division as a whole, but difficulty is still being experienced in some directions. This applies especially to the recruitment of senior veterinary officers and men capable of performing efficiently the duties of advisory officers in the Cattle Husbandry Branch of the Division.

At the other end of the scale there have been very few applicants for appointment as cadets and young men are still required for training in this category with a view to appointment to advisory technical staff at a later date.

In the Veterinary Services Branch, five new veterinary officers were appointed. As a result, a veterinary officer was stationed at Barcaldine for the first time, a vacancy at Roma was filled, an additional appointment was made to Townsville and two new appointments were made to Brisbane. One of the additional appointees to Brisbane is engaged on a special study of meat inspection and grading and the other is available to the Poultry Branch for disease investigations.

Vacancies for two divisional veterinary officers unfortunately remain unfilled. It is essential that the occupants of these positions have considerable experience and no suitable applicants came to light during the year.

Where inspectors of stock are concerned the position is one causing considerable concern. As at June 30 there were 11 vacancies and the need for an additional inspector in a centre where a meatworks has been established. To meet this difficult situation, eight temporary inspectors have been appointed, but of course as they are as yet inexperienced it will be some time before complete relief is afforded as a result of their appointments. All these officers will sit for the next examination to be held of candidates for appointment to the Department as Inspector, Division of Animal Industry.

The officer in charge of Oonoonba Animal Health Station departed for South Africa early in the year on a study tour and a replacement was effected by the transfer of a veterinary officer from Yeerongpilly Animal Health Station. An additional appointment to the staff of the Research Branch has been a veterinary officer with an European as well as an Australian degree in veterinary science. This officer is to concentrate on research connected with meat inspection.

The Sheep and Wool Branch was successful in filling all positions provided for up to the present time. Advisers have been appointed to Dalby and Winton, centres which had been vacant for some time. The appointees will take up duty immediately after completing a special course of instruction that they are at present undergoing. In the Wool Biology Laboratory the staff is up to strength with the appointment of an assistant wool technologist, an assistant to biometrician, and replacements for laboratory assistants who resigned earlier.

During the year an attempt was made to recruit additional advisory staff for the Cattle Husbandry Branch but met with little success. Great difficulty has been found in attracting men with appropriate educational background who at the same time have any considerable experience in the cattle industry, especially in a responsible position. This is somewhat in contrast with what has been found in the case of the Sheep and Wool Branch. As at June 30, 1952 there were vacancies in the Cattle Husbandry Branch for five advisers and two assistant husbandry officers, as well as field assistants and cadets. Training of cadets has in the past presented problems, but with plans for the development of field and regional experiment stations now taking shape it can be anticipated that in the near future facilities for training such officers will become available. The passage of time, therefore, will ensure complete and efficient staffing of the Branch, but in the meantime further efforts must of course be made to speed up the process by recruiting suitable men from the industry. The retarded development of the Cattle Husbandry Branch is particularly unfortunate at a time when so much stress is being placed on the necessity for increasing production in the beef cattle and dairying industries.

The Poultry Branch succeeded in filling three vacancies for inspectors. Replacements have consequently been effected at Toowoomba and Ipswich and preparations are in hand for opening a new district at Caboolture.

The Pig Branch lost the services of a cadet with nearly three years' training, and although a replacement was recruited it will be some time before the leeway can be made up.

VETERINARY SERVICES BRANCH.

The unfavourable seasonal conditions were responsible for a reduced turn off from fattening areas, many stock being held over for an additional season, with the result that the demand for replacement store cattle was very limited. In consequence there were reduced stock movements during the autumn of 1952 and many that did take place were for the purpose of transferring stock from drought-stricken areas to country where feed was available rather than the normal transference of store stock from breeding areas to restore numbers in the fattening areas.

The failure of rivers such as the Flinders and Georgina to run and provide surface water along stock routes has added to the difficulty of moving stock from drought-stricken areas. The stock routes from the Northern Territory via Lake Nash to the railhead at Dajarra, and from the Gulf areas to the railhead at Julia Creek, became untrafficable early in 1952 and alternative routes had to be used by stock which could be moved.

Improved pastoral conditions in central and southern Queensland increased stock movements during the late autumn and winter of 1952, but in general stock movements during the 1951-52 season were considerably below those of the previous year.

The general incidence of disease was below the average of normal years and this was largely associated with the dry conditions and restricted stock movements. Severe losses, however, were associated with outbreaks of contagious pleuro-pneumonia, tick fever, blackleg, and plant and mineral poisoning. Two unusual happenings during the year were a high incidence of scrub-tick paralysis in cattle and pigs and heavy losses of forward dairy cows from a sickness described as drought paralysis. Losses from poverty were very heavy and far outnumbered losses from other causes.

Plate 1.—Santa Gertrudis Cows Under Drought Conditions in Texas, U.S.A.

Plate 2. Good type Santa Gertrudis Bulls.

Plate 3.—Typical Young Santa Gertrudis Bulls Imported to Queensland.

Plate 4.—Calves Reared on Selected Rations in the Monto Calf-rearing Trial Conducted Under the Commonwealth Dairy Industry Efficiency Scheme.

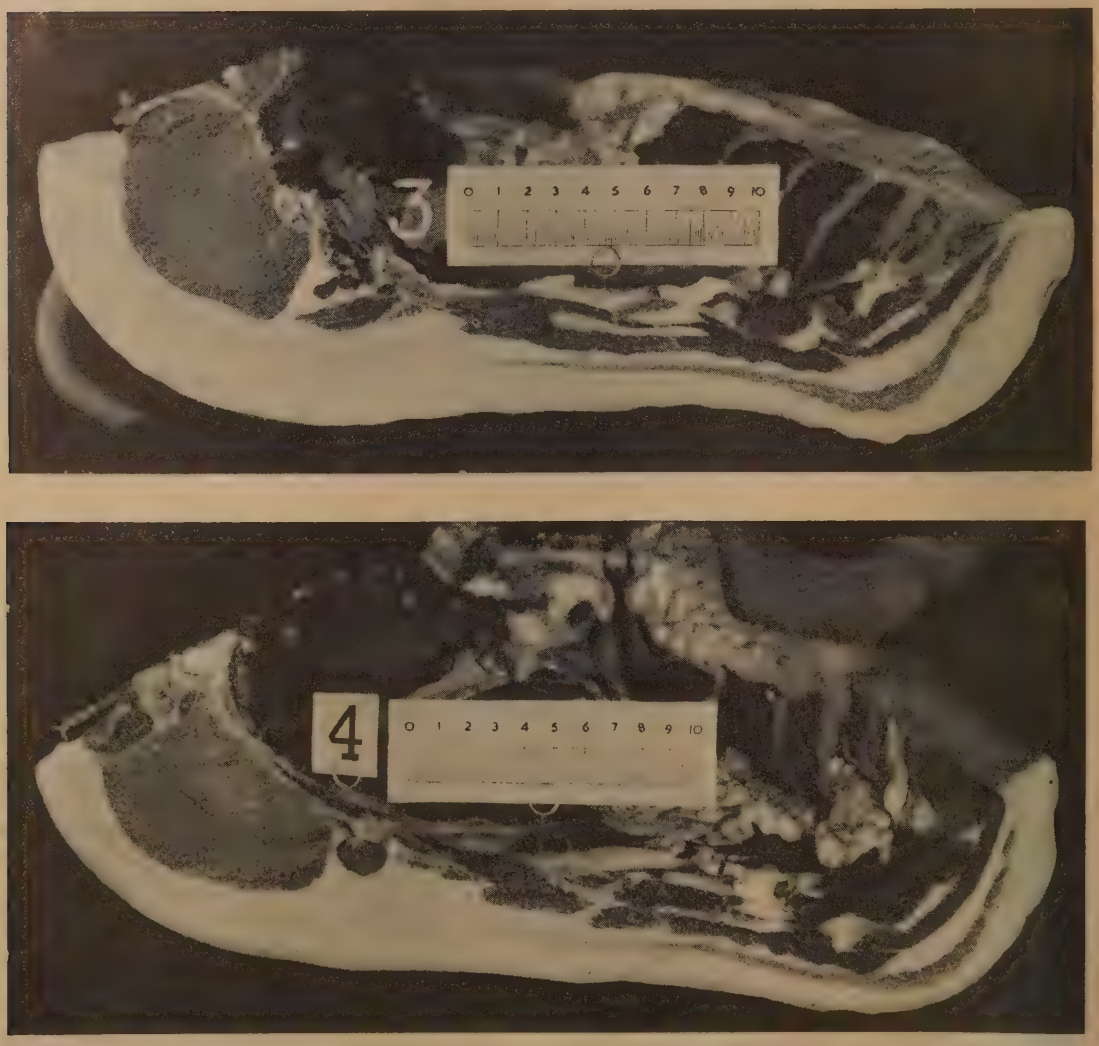


Plate 5.—Backfat Thickness of Pig Carcases has been Reduced in Experimental Work by Feeding Lucerne Chaff in the Finishing-off Stage to Lower Overall Digestibility. Pig No. 4 Received Lucerne Chaff as a Substitute in the Ration; Pig No. 3 did not.

Pleuro-pneumonia was again one of the most serious infectious diseases encountered, but the 23 recorded outbreaks showed a marked reduction on the 58 of the previous year. Eight of the outbreaks occurred in Northern Territory cattle shortly after entering Queensland, and most of the others occurred in or originated from enzootic areas in central or north-western Queensland. The south-eastern section of the State remained relatively free from the disease, but two outbreaks were recorded in the Brisbane district and one in the Burnett district.

Control of this disease was discussed by the Director of Veterinary Services with representatives of the Northern Territory Administration at Camooweal before the onset of the present cattle season, and agreement reached that all cattle from the Northern Territory should be inoculated under supervision prior to entering Queensland.

Investigations of pleuro-pneumonia incidence were undertaken during the year by a veterinary officer in north-western Queensland and the Northern Territory and much useful information was obtained. Control measures are being adjusted accordingly. More intensive inspections and surveys are being undertaken in Queensland to detect outbreaks of the disease. When this work has been completed, suspected areas will be defined and more stringent control measures will be enacted to protect the disease-free areas of the State.

The Departmental tuberculosis-control scheme was continued and extended. The number of cattle included under the testing scheme increased from 100,000 to approximately 300,000 during the year, while the actual number tested increased from 88,000 to approximately 160,000. Twenty-two approved veterinary surgeons are now undertaking tuberculin testing under the control of the Department in most of the principal dairying districts, while Departmental officers are serving areas where practitioners are not established. The incidence of tuberculosis in herds supplying milk to south-eastern Queensland, which have been subjected to regular testing over a number of years has been reduced from 11.86% in 1947 to 0.64% in 1952, while the general incidence of all herds tested throughout the State is also very satisfactory, being less than 1%. Tuberculosis control has been extended to beef cattle in areas where a relatively high incidence of the disease has been recorded in the cattle at slaughter-yards and meatworks.

Serious outbreaks of tick fever, with losses of up to 50 head in individual mobs of travelling cattle when being moved from lightly to heavily tick-infested country, were recorded. Preventive inoculation of a large number of cattle being moved from the western drought-stricken area to the coast was undertaken under the supervision of Departmental officers, with satisfactory results.

The high incidence of blackleg which was in evidence during the winter of 1951 gradually receded and had almost disappeared by the summer. A vaccine prepared from organisms obtained from field cases was made available for distribution under supervision of field officers. Properties on which the vaccine was used were kept under observation and all subsequent outbreaks of blackleg have been closely investigated. The incidence of the disease during the past six months, however, has been so low that little information on the value of the vaccine could be obtained.

Cattle-tick infestations varied considerably throughout the year and they were affected to a large extent by seasonal conditions. Infestations gradually built up during the dry period in the spring and became heavy towards the middle of the summer. They were accentuated by difficulty in mustering and travelling cattle to dipping centres. The newer insecticides DDT and BHC are now extensively used by stock-owners for cattle-tick control with satisfactory results, but in the opinion of some stock-owners in Central Queensland, during the period when infestation was heaviest control with preparations containing BHC was not so good as in previous years.

The policy of the Department in charging and maintaining DDT dips along the principal stock routes and in marginal areas was continued and extended. A total of 52 dips, including nine charged during the year, is now included in this scheme. The utilisation of recently charged dips on the principal stock routes leading from the north-western infested border areas greatly assisted the cleansing and uninterrupted movement of drought-stricken cattle from this country. It would not have been possible to obtain effective tick control and move the cattle if these dips had not been available.

Seasonal conditions were unfavourable for buffalo fly propagation and the fly disappeared from the Roma district and died back along the coast to Gladstone. The rail and road control plants were moved from Gayndah and Gympie to Monto and Rosedale respectively, and the checking of the fly at these centres gave relief from fly worry in the area of high cattle population along the coast and in the Upper and Central Burnett districts.

Deaths from plant poisoning were greater during the past year than those experienced during a normal season and were one of the principal causes of loss to the stock industries. Factors associated with the increase in plant poisoning included the shortage of natural feed during the drought period, the movement of stock to relief pastures, and unusual climatic conditions. The principal plants involved in or suspected of causing serious mortalities were Ellangowan poison bush, Noogoora burr, Georgina gidyea, Moreton Bay chestnut and paspalum.

Most deaths from mineral poisoning were directly attributable to arsenic. The sources of arsenic included dip refuse, discarded arsenic-containers and arsenic-sprayed pastures. A number of deaths of cattle following dipping in BHC were suspected of being due to poisoning by this substance.

ANIMAL HEALTH STATIONS.

Tick-fever immunisation of cattle declined to some extent because of the very dry conditions prevailing during the spring and the earlier

half of the summer. During this time there was an appreciable fall in the price of beef cattle other than fats. This feature is one that invariably affects the purchase of bulls, particularly from southern States and the Darling Downs. On the other hand, the continual advance in the price of dairy products brought in many dairy cattle, though this increase has not yet been sufficient to offset the decline in beef animals. The last four months of the year showed an improvement in weather conditions, with improved pastures, and this has brought about an increase in the number of beef cattle passing through the Animal Health Stations. On the whole, immunisation has been very satisfactory, though three animals collapsed and died after treatment with one of the well-known specific synthetic drugs used for controlling reaction to inoculation. Happenings of this nature have been recorded in the literature, but are evidently rare.

Tick-control trials have been continued and extended. As a result of laboratory tests, a more complete picture is being obtained of the reaction of the tick at its various stages of parasitic life to the application of synthetic insecticides used alone or in combination. This work is a prolonged process and involves the continuous daily control and observation of many animals, all of which have to be properly prepared before they can be brought onto experiment.

Four dipping vats have now been charged with toxaphene. Two vats have been in use for some time, and the biological tests applied periodically suggest that there has been no deterioration in efficacy.

During the dry period experienced in the second half of 1951, when many cattle were suffering from poverty, several deaths occurred following the use of BHC for tick control. From the symptoms shown it seems that poisoning by the gamma isomer in this substance was responsible. Previously it had been considered that the margin of safety with BHC preparations was fairly wide, but this opinion has now to be revised. With the advent of good rains and better pasture early in 1952, there were no further reports of trouble. However, it is difficult to believe that poverty alone was responsible.

Wallum disease of cattle is a condition observed chiefly during drought periods. As a result it was expected to see a number of cases late in 1951, but although reports from various districts indicated that cases occurred over a wide area, little opportunity was presented for investigation at first hand. The condition simulates the zamia poisoning reported by Edwards in Western Australia and also by Stewart in New South Wales over 50 years ago. Some farmers in Queensland believe that there are two different morbid conditions present in the wallum country, one due to the eating of zamia, the other of unknown origin and which they describe as "wamps." Feeding experiments are now being carried out with different species of zamia. It seems, however, that the basic cause of the condition may be a deficiency in the diet.

Investigations of Georgina River disease were carried a stage further. The evidence obtained was sufficient to reject the idea that the Eremophilas are responsible, for sheep pastured in one area from which these plants had been removed contracted the disease and several died. Attention has once again been directed to the gidyea tree, and experimental work has been designed and will be attempted in the coming year if conditions are found suitable. The disease causes heavy losses in both cattle and sheep everywhere in the Georgina River watershed. Surveys are being carried out with the object of obtaining information on the seasonal occurrence of deaths and their relationship to certain types of pasture, etc.

Copper deficiency is now recognised as being widespread along the Queensland coast. The condition can be prevented or brought under control by the provision of copper supplements. Work on a suitable and convenient means of supplying sufficient copper to provide the animal with at least three months' supply at a time is being undertaken in conjunction with the Chemical Laboratory. It has been noted that when supplied by mouth only 10% of the copper is retained, but other routes of supply have been devised which permit of a 90% retention of the copper supplied.

Liver biopsy (a surgical technique that permits a liver sample to be taken from the living animal) is now being used on experimental animals as a means of determining the amounts of copper retained by the animal. It is also useful in determining the copper status of grazing cattle.

Observations on the seasonal fluctuation of the worm burden of dairy calves in selected areas has been continued in conjunction with C.S.I.R.O. On the Darling Downs, infestations with barber's pole worm (*Haemonchus contortus*) are invariably low, while nodule worm (*Bosicola radiatus*) is much more common and is probably the chief pathogen of later autumn and winter.

Work has been continued on Tallebudgera horse disease. It has been found impossible up to the present to reproduce the disease by feeding Crofton weed (*Eupatorium adenophorum*), a plant strongly suspected as being the cause. Further feeding experiments are to be commenced shortly.

The occurrence of a peculiar disease in horses in North Queensland, characterised by ulceration of the oesophagus and stomach and proved to be due to the eating of the plant *Crotalaria aridicola*, was referred to in last year's report. Recently, cases of the disease have been seen in Central Queensland by an officer who has had some experience of the condition in the north. In Central Queensland the horses were grazing on pasture where another Crotalaria (*C. trifoliastrum*) was common. Experiments with this species have not yet been carried out but will be started as soon as supplies of the plant become available. It is interesting to note that *C. trifoliastrum* is widely distributed in the Northern Territory but so far as is known is not harmful to horses. In the Territory it

has been regarded as one of the agents possibly responsible for walkabout disease, but this does not seem to be so likely now.

Birdsville disease, a condition caused by eating the plant *Indigofera enneaphylla*, has been seen in north-western Queensland, the first definite record from this area.

In last year's report reference was made to the isolation of a brucella-like organism from some cases of epididymitis in rams, and inoculation of this produced a condition comparable with the natural disease. This work has been continued, one line of investigation being an attempt to determine the method of natural infection and another the development of a serological technique for detecting infected animals.

Melioidosis was seen again in the Hughenden district. Agglutination tests and melioidin reactions were used in an investigation directed towards detecting infected animals in a goat herd in North Queensland, where an occasional goat has died from the natural disease. Forty-nine goats were killed on the evidence of one or other of these tests and in nine the organism was recovered.

More than 1,500 blood samples were received for the swine brucellosis agglutination test, these coming mainly from the 68 herds listed under the Department's brucellosis-tested herd scheme. The disease was detected in six herds, but 62 herds were free.

An investigation of the cause of the tubercle-like lesions seen in the lymphatic glands of pigs' heads at abattoirs was recently commenced. Much useful information has been obtained as a result of this enquiry and results so far suggest that it may be possible to differentiate them from true tuberculosis and thus save extensive loss of heads previously condemned. The work is being continued.

Two of the most interesting conditions noted during the year were avian salmonellosis and salt poisoning in chickens, while the laboratory at Oonoonba reported the frequent occurrence of botulism in ducks and fowls. Pullorum disease is now of minor importance, due to the Departmental blood-testing scheme. A vitamin-A survey has been commenced to determine, if possible, the relationship of borderline deficiency to some of the obscure diseases seen in poultry and which may be related to lack of vitamin A.

SHEEP AND WOOL BRANCH.

Adverse seasonal conditions were experienced in the greater part of the sheep pastoral country during the year. Early summer storms brought bushfires rather than relief rains and as a result many graziers were faced with the prospect of drought early in 1952. General rain fell over most of the southern part of the State during late summer, but the north-western part has not yet received any rain of lasting benefit and the position there is serious.

Sheep numbers continue to fall as a result of poor lambings recorded generally throughout the State. This, in conjunction with the fall in the wool market, was responsible for a marked drop in the value of the State's clip. Returns submitted by wool growers to the Government Statistician showed the sheep population at March 31, 1952, to be 16,156,400, compared with 17,477,578 in the previous year. During the greater part of the last decade, sheep numbers have been below the 60-years' mean of 18.5 million and there is at present little indication of likely improvement in the near future.

The State's flocks consist almost entirely of Merinos and very few sheep are kept specially for their mutton qualities. The Department has attempted to popularise the crossbreeding of some sheep for mutton production and the raising of some lambs in conjunction with dairying, but comparatively little interest has been shown in these forms of animal production. It is apparent, however, that production in Queensland will have to be diversified more to include the running of several types of livestock in the sub-coastal agricultural country and that agricultural pursuits will have to be extended into areas such as the Maranoa and the Central Highlands, which are used extensively for pastoral production.

A school for sheep and wool extension officers was conducted by officers of the C.S.I.R.O. in conjunction with this Branch. All mainland State Departments of Agriculture sent representatives to the school and New South Wales in particular was strongly represented. The unpublished results of much research were made available and the possibilities of their field application submitted to critical discussion as between the research officer and the extension worker. This achieved a most useful purpose and the school was generally held to have been a most successful innovation.

Studies of the climate of Queensland, with special reference to the occurrence of drought, have been completed. Detailed studies of the monthly rainfall records of 49 centres in Queensland have been made. The frequency, amount and distribution of rainfall and the incidence of dry periods have been examined, and comparisons with production have been made. This work has already been utilised in advising owners placed in the position of having to decide whether or not to undertake supplementary feeding under drought conditions. It has also been useful in relation to land utilisation.

A long-term investigation has been initiated to determine the possible cause of "doggy" wool. Such wool lacks elasticity, character and handle, and has poor manufacturing properties. The sheep which tend to go doggy have a more uneven and stronger wool than others and there is an indication that the former group has a higher ratio of primary to secondary fibres.

Eleven observations concerning neo-natal mortalities in lambs have been made in Queensland since 1949. From these observations it can be assumed that one-third of all the lambs

born north of Longreach in the last three years died prior to marking. Only 5½ million lambs have been marked in this area since 1949. Possible methods to decrease these losses are being worked out. Further work on this subject is necessary to determine why lambs carried during the summer are smaller than those born after the winter.

A trial is being conducted to compare two different methods of performing the Mules operation for control of blowfly strike in sheep. Blowflies have not been active since the sheep were treated, but some observations regarding healing processes under field conditions have been made.

Most of the year's work in the Wool Biology Laboratory has been of an investigative nature. Slides, diagrams and other information have been sent out to the field staff to help them in extension work in sheep breeding.

Development work on Toorak Sheep Experiment Station progressed satisfactorily throughout the year. Very little maintenance work had been done during the 10 years prior to the station being taken over by the Department. During the year under review, improvements effected with funds provided by the Commonwealth Government included complete renovation of the homestead and the erection of a cookhouse, office, cottage, implement shed, meathouse, men's dining room, shearing shed, shearers' quarters and a set of sheep-yards. Bore drains on the property have been re-routed and constructed to give better utilisation of existing water. Three experiments are being conducted at Toorak at present—hand-feeding of sheep, the incidence of oestrum in Merinos in the tropics, and the use of urea as a protein supplement.

CATTLE HUSBANDRY BRANCH.

The cattle country of the State experienced one of the driest seasons on record. The wet season of 1950-51 ended two to three months earlier than normal. A relatively cold, windy winter was followed by a dry spring and early summer in 1951-52. At the end of 1951, animal production was at a very low level and stock were dying from poverty in practically every district of the State.

No widespread flood rains were experienced during the wet season of 1952, but a large area of country received reasonably good relief rains during the period, February to April, and a good growth of pasture followed. The rains in this area, while being satisfactory for pasture development, were only of a light nature and gave very little run-off. Surface water supplies consequently were not adequately replenished and a widespread water shortage before the onset of the next wet season is anticipated in country dependent on streams and dams. The areas which received the rainfall have made a good recovery and fat stock are being marketed. However, the general turn-off has been below normal.

There was a serious slump in export killings for the year under review in comparison with 1950-51. This slump was due almost entirely to drought conditions; monthly killings declined from October onwards. Brandings seem certain to show a serious decline on the previous year and may be the lowest since 1946. It is expected that slaughtering will be normal during the early spring months of 1952 because of the favourable winter season.

Dairy production was severely affected by the drought, and spring and summer production showed a very steep decline on the previous year's production. Good early-autumn rains ensured an excellent season in all dairying districts from April onwards and production during late autumn and early winter has been at a very high level.

Drought conditions seriously affected the production of both roughage and concentrate feedstuffs. The production of lucerne hay was limited to irrigation areas for the greater part of the year, and serious shortages occurred in all grains. Smaller export killings at meatworks, particularly at the Brisbane Abattoir and Lakes Creek, reduced meatmeal supplies. Steep price increases which resulted from reduced production made it impracticable for dairymen to hand-feed for the production of butterfat, unless in possession of supplies of home-grown fodder.

Trials carried out with the Dairy Research Branch on one property in the Beaudesert area indicated that the feeding of hay roughage may have a beneficial effect in increasing butterfat percentage as well as overall milk production during the late-winter and early-spring months. This is an important problem in south-eastern Queensland, where many producers experience difficulty in meeting the minimum legal requirements in respect of butterfat content of milk. The work is to be repeated and extended next year.

Concentrate-feeding demonstrations under the Commonwealth Dairy Industry Efficiency Grant were continued in six districts. In the Atherton area one farm was withdrawn. Considerable difficulty was experienced in maintaining the trials throughout the year because of shortage of concentrates.

The trials have demonstrated that at current prices for milk and grain it is impossible to feed concentrates at a profit at any level of feeding, except when dairying for the whole-milk trade. The information being obtained will, however, be of value for future extension work when the milk/grain price ratio is more favourable.

Outstandingly good results have been obtained on one farm in the Gympie district as a result of feeding high levels of phosphate supplement. Samples of surface soil (to a depth of 12 inches) taken from the property were found to be low in phosphorus.

Calf-feeding demonstrations were extended to three new areas during the year. Very useful information is being obtained on the efficiency and economics of raising calves on limited quantities of milk.

The work at Kin Kin in connection with mineral-deficiency demonstrations was continued with encouraging results. Good crop response was obtained to topdressings with superphosphate and copper, and this response was transmitted through the cows to milk production. The property is in an area in which deficiencies of phosphorus and copper in the soil are widespread.

The existence of copper deficiency has been established on the South Coast and arrangements for carrying out a copper-supplement demonstration on two farms in this area next year are now in hand.

The popularity of dairy-farm competitions has increased considerably and the number of entrants in the 1952 competition showed a considerable improvement on previous competitions. There can be no doubt that these competitions have stimulated farmers to practice more efficient methods of production. Judging of the competition has, however, become a problem in that some field officers have had to devote several weeks entirely to this work. Field days have been held on the winning farms in the 1951 competition.

In co-operation with the Veterinary Services Branch, a programme of control of trichomoniasis was instituted in a Brisbane dairy herd where the infection had been diagnosed in the previous year. By the use of artificial insemination it was possible to obtain normal conceptions in all non-infected cows and subsequent pregnancies were normal. The herd has now been returned to service by a non-infected bull and the final success of the control programme will be judged on the results of this season's breeding.

In conjunction with dairy-heifer-raising trials, A.I.S. steer calves have been raised for beef production. Using skim-milk and grain, calves have been grown to approximately 300 lb. liveweight at a cost of about £9 per head. This is not a good result and the work is to be repeated to determine whether improvement can be expected.

The herd at Kairi Regional Experiment Station now consists of some 70 head of cattle, of which approximately 25 head are milking cows. The remainder are heifers, calves and experimental steers.

A trial in which BHC-treated grain was fed in order to ascertain if a milk taint would result was negative. Six pounds of grain per day failed to produce any detectable change in milk flavour. BHC is used to protect grain against insect attack and overseas reports have been to the effect that if such grain is fed to dairy cows a taint will be produced in the milk.

A progeny-testing programme with bulls on the station is being followed. The original sire was sold during the year, with the right to re-purchase in two years' time should his daughters prove satisfactory producers.

During the year an officer was stationed at the Bureau of Tropical Agriculture at South Johnstone in order to assist with beef cattle work being undertaken there. Apart from routine duties on the property, he will make some observations on grazing habits of cattle in the tropical environment.

Phosphate deficiency is considered to be of particular importance in reducing production of beef in Central and North Queensland and an effort is being made to map out the areas where phosphate deficiency is most likely to occur. With this in mind, a field kit for on-the-spot blood-phosphate analysis was obtained; it has been used by officers of the Branch on visits to properties in the Central Highlands and Charters Towers districts.

Copper deficiency was diagnosed on several other coastal properties and work has been undertaken on the Near North Coast in co-operation with other Branches of the Department in an effort to find a practical method of control.

PIG BRANCH.

Production figures reveal a decrease of approximately 20 per cent. attributable mainly to drought conditions, but shortage of animal-protein foods and shortages and high prices of feed grain, fencing wire, piping and certain types of building materials were also factors in preventing increased production.

The quality of the pigs forwarded to market was generally very fair. The year saw a marked decrease in the number of overfat pigs coming forward, mainly, it is thought, because of the drought and high prices and shortage of feed grains forcing unfinished and lightweight pigs onto the market.

The United Kingdom price of pigmeats for export is substantially below the price asked for by the industry; this, together with the shortage of pigs and the local price (which is now 2s. 4d. per lb.) has resulted in considerable reduction of export to the United Kingdom. Another factor influencing export to the United Kingdom is that as from May 2, 1952, pigmeats may be shipped on a trader-to-trader basis to all destinations other than the United Kingdom.

Reports from the field staff indicated that there was a keen demand for stud pigs in all pig-raising areas. Progeny testing to overcome the limitations of selection of breeding stock on appearance has been continued at Kairi Regional Experiment Station and the experience gained will be valuable in relation to the operation of a Test Station when established.

Cured baconer carcase competitions continue to be popular and are assisting producers and stud-breeders to a better understanding of trade requirements. The Australian Meat Board's chilled baconer carcase competition was again a success, with an increased number of entries. These competitions have been conducted each year for the past five years and an analysis of results indicates an overall improvement in quality of approximately 10%.

A general approach has been made to the problem of measuring carcase quality in bacon pigs. A study has been made of the application

to the Queensland environment of the standards used in the Hammond appraisal system. For some characters it appears that certain adjustments to the Hammond scale of points might be made with advantage.

An experiment to determine the effect of increased fibre in the ration of baconer pigs was conducted at H.M. State Farm, Palen Creek. The use of lucerne chaff, by effecting a decrease in overall digestibility of the ration, reduced growth by approximately 12% and there was a resultant improvement in carcase quality.

An investigation of the supplementary value of condensed whale solubles was made at Yeerongpilly Animal Health Station. Results revealed evidence that condensed whale solubles contain the animal protein factor; however, the all-vegetable ration supplemented at the 8% level proved greatly inferior to a recommended ration which uses meatmeal as a concentrate and source of A.P.F.

Some experience in the nutritional use of antibiotics was gained in an exploratory feeding trial using a streptomycin-terramycin preparation. Evidence suggested that reported phenomenal growth increases may only occur in special cases or conditions of management and that field application requires further investigation.

The stud herd of Tamworth pigs at Kairi Regional Experiment Station has been maintained. At Hermitage Regional Experiment Station, the fencing of yards and paddocks is progressing. It is hoped to establish a herd of Berkshire pigs at this station during the coming year.

The brucellosis-testing scheme has been continued and at present 62 herds have been tested and issued with appropriate certificates; a further 15 herds have entered the scheme.

The health of stock has been generally satisfactory. In the Warwick area and at one stud in the Moreton area, trouble was experienced with sows not producing milk after farrowing. This condition is thought to be of a nutritional nature, but despite continued investigation the actual cause has not yet been determined.

POULTRY BRANCH.

Although earlier there were very definite prospects of the downward trend in egg production being arrested, the shortage of grain, which is the basis of all poultry feeding, has been responsible for the slaughter of an unduly high number of laying hens and young female fowls prior to the latter coming into production, with the result that egg production has declined in all areas of the State. Poultry farmers are for the most part located in coastal areas and as a result are unable to grow their own grain.

In southern Queensland, the principal egg-producing area, production was down by about 20% compared with the previous year. In Central Queensland, where the shortage of feed appeared to be more acute than in any other area, the intake of eggs by the Central Queensland Egg Marketing Board was about 45% less than that of the previous year. Officers stationed in North Queensland estimate a decline of 10% in that area.

In addition to the grain shortage, there has been an extreme shortage of protein-rich foods. This industry depends upon the by-products of meatworks for protein-rich foods, and with the reduced killings due to drought it has not been possible for manufacturers of prepared foods to obtain a supply sufficient to keep the protein level of these foods at a standard necessary for growth of young stock and for efficient production. This also has contributed to a lower output.

The prospects of building up a substantial trade in the export of dressed poultry appeared bright for some years past and continued to do so during the greater portion of the year under review. Great Britain is Australia's best customer, but falling values in that country have resulted in processors reducing the price to farmers for chicken meats from 2s. 9d. to 1s. 9d. per lb. and for hen meat from 1s. 9d. to 1s. 4d. Although there was a large increase in the raising of poultry for this market during the early portion of the period under review, farmers are now displaying little interest in the raising of poultry for export purposes.

A slight decline in the number of birds submitted to the pullorum test by officers of the Poultry Branch can be attributed to a depletion in flocks. Continued testing has resulted in lowering the incidence of this disease; of the flocks tested during the year there were over 120 in which the incidence was less than 2% and 50 of these had less than 1%.

Experiments were conducted by the branch at Yeerongpilly Animal Health Station, and at the Kairi Regional Experiment Station. At Yeerongpilly, experiments to determine whether BHC, when added to laying mashes in either commercial or deodorised form, would taint eggs were completed, and it can now be stated that either form of BHC, even when used at a level as low as 5 p.p.m., will after a period of time cause off-flavours in eggs.

An investigation of the protein value of condensed whale solubles, a by-product of the whaling industry, was also conducted at Yeerongpilly. Condensed whale solubles were added to all-vegetable protein rations at the rate of 2%, 4%, and 6% and the growth rates of chickens on these rations were noted weekly. While the results obtained were not outstanding, a definite response was noted in chickens fed an all-vegetable protein ration containing 6% C.W.S., and it is planned to conduct further work on this subject during the coming year.

During the past five years the effect of feeding increasingly high amounts of maize to fowls of all ages has been investigated at Kairi. The completion of maize-feeding trials with first-and second-year hens during the year under review marks the end of this series of experiments. While there is a definite limit to the amount of maize which can be incorporated in chick-starter mashes, the data from all experiments on birds over eight weeks of age suggest that rations may contain up to 70% maize without any discernible effect on growth and production.

DIVISION OF DAIRYING.

Director: Mr. E. B. Rice.

Drought conditions which had commenced in the summer of 1950-51 were not relieved until the end of February, 1952, though partial relief rains fell in isolated districts during the spring months. The drought had a most detrimental effect on the dairying industry; as water supplies and fodder became exhausted, stock losses were serious and production receded in the spring and summer months instead of showing its normal sharp increase. Grass fires aggravated the position during the dry months. Inevitably, therefore, there will be found in this report continuous reference to reduced or suspended activities of the field work of the Division.

Following the good soaking rains in February and beneficial falls throughout the remainder of the year, there was a prolific growth of pastures and fodder crops in the late autumn and winter. The protein content and palatability of the pastures were then better than average, dairy cattle rapidly regained condition, and production reached a high level for so late in the season. The soaking rains in June ensured favourable conditions for the opening months of 1952-1953.

BUTTER PRODUCTION.

Reflecting one of the worst droughts ever experienced in Queensland, butter production was 27,395 tons, only 58% of that of the previous year. Only 2,750 tons were exported overseas.

The quality of butter was also seriously lowered by the unfavourable seasonal conditions. The results of official gradings are as follows:—Choice 32.45%; First 60.03%; Second and Pastry 7.52%.

Under the guarantee of the Commonwealth Government to return to producers the cost of production, the price of butter to producers was determined at 3s. 6d. per lb. commercial butter from July 1, 1951.

Satisfactory progress was made in renovating factory buildings and installing equipment, excepting butter churns, which continue in very short supply. The supply of essential manufacturing requisites, such as salt, boxes, detergents and neutralisers, has eased appreciably.

The necessity of placing butter in cold-storage during the flush season to meet the winter demand in this State and New South Wales focuses attention on problems of keeping quality, and technical aspects of this problem are being studied.

It seems evident from the figures for the past few years that the production of butter in Queensland has reached a more or less static position. In view of the increasing local demand, this is materially reducing the exportable surplus at a time when Australia urgently needs to raise its income from exports.

CHEESE PRODUCTION.

The drought had a twofold effect on the production of cheese; firstly, milk supplies to the factories fell to a low level, and secondly, cheese factories were called upon for a time to supply "accommodation" milk for Brisbane and other towns to make up the deficiency from the normal supply areas. Consequently, cheese production at 4,464 tons reached the lowest level recorded since the industry has been of major importance in Queensland.

Although quality was somewhat below that of the previous year, the results achieved, having regard to the abnormal conditions, can be regarded as reasonably satisfactory. Grading results were:—Choice and First 68.26%, Second 30.64%, Third 1.10%.

Four cheese factories ceased operations during the year, but in two cases the milk was diverted to other factories. A new factory is under construction at Kenilworth, and plans for the installation of cheese-manufacturing equipment at the Maleny factory are in hand. This development of cheese manufacture in conjunction with milk treatment can be expected to expand in the future, as several other companies which have engaged in milk treatment and pasteurisation envisage such action to ensure the availability of adequate quantities of milk for the milk trade at all times of the year and the conversion of any surplus during the flush season into cheese.

Appreciable improvement to some factory buildings was made during the year.

MARKET MILK AND MILK PRODUCTS.

The adverse seasonal conditions created much difficulty in maintaining adequate supplies of milk for milk-pasteurisation factories during the critical drought period, and necessitated the factories accepting many new suppliers. Rationing of deliveries to consumers was unavoidable at times. At one stage milk for Brisbane was drawn from 10 cheese factories. The Kingston butter factory also became registered as a milk-chilling depot for forwarding milk to a Brisbane milk-pasteurisation factory.

The inexperience of many new suppliers in producing milk for the market-milk trade, coupled with the effect of drought, caused a temporary slight decline in milk quality.

The forwarding of milk from country factories by means of road milk-tankers, which has now almost entirely displaced delivery in cans, is a decided improvement in bulk-milk transport and will reduce transit losses and help to maintain quality. It is of interest to record that milk is now being forwarded by road tanker a distance of 294 miles from Malanda to Townsville.

A feature of the year has been the work carried out by Brisbane milk wholesalers in improving their suburban milk depots.

HERD PRODUCTION RECORDING.

A total of 112 pedigree herds was entered in the Pure Bred Dairy Cattle Production Recording Scheme, but 46 were withdrawn due to the adverse season. It is disappointing that only 32% of the cows recorded produced the required quantities of butterfat to become eligible for entry into the advanced register of the respective breed societies. While seasonal conditions were unsatisfactory during the year, the results, together with those of previous years, suggest a failure of breeders to produce stock genetically capable of satisfying the standards. The annual report on pure bred production recording published as a supplement to the *Queensland Agricultural Journal* is being well received by farmers, who use it for reference in purchasing stud bulls.

In accordance with the practice in other countries, a register of merit for dairy cattle was instituted during the year; it should prove a further useful adjunct to the herd improvement scheme.

Grade herd recording groups in operation during the year numbered 45, but the drought forced the withdrawal of many farmers from the scheme and necessitated either several herd recorders being placed on part-time duties or the temporary amalgamation of adjoining groups. The recording of data by means of automatic calculating machines installed last year in the Government Statistician's Office has greatly facilitated the office work and the surveying of data accumulated from herd production recording.

In the recording year ended September 30, 1951, 26,798 cows in 814 herds completed lactations. The average production per cow was 146 lb. butterfat, compared with 152 lb. for the previous year. The cows in the Atherton Tableland recording groups had the highest district production—186 lb. The scheme is stimulating interest in better farming practices; this is reflected in the production increase in herds which have continued recording over a period of years—for example, one herd has shown successive butterfat averages of 137 lb. in 1948-1949, 169 lb. in 1949-1950, and 221 lb. in 1950-1951.

Associated with production recording, surveys of data have provided valuable information on the causes of herd wastage, the effect of the month of calving and length of lactation on production, and other aspects of dairying. The results of these surveys are published from time to time in the *Queensland Agricultural Journal.* A comprehensive survey of Queensland dairying practices is also being undertaken from data collected.

DAIRY INDUSTRY EFFICIENCY SCHEME.

Projects were carried out during the year on 63 demonstration farms throughout the State. Eight co-operating farmers withdrew, five due to sales of their farms and three because of reduced dairying operations. Four new demonstration farms were selected. The satisfactory progress being made is referred to in the report of the Field Services Branch.

The prolonged drought was not conducive to the holding of field days on demonstration farms, but there were good attendances at the seven field days conducted and keen interest was displayed. The value of the demonstration farms as focal points for extension work is becoming evident, and many neighbouring farmers visit the farms to observe the various projects being demonstrated.

Twenty-three farms were withdrawn from the original 104 entries in the Dairy Farm Competition. Good attendances were recorded at the nine field days held on prize-winning farms. A total of 191 entries was received for the 1952 competition, the preliminary judging of which has been completed.

Field officers took 1,224 photographs to illustrate features of developments on demonstration farms and of entries in competitions.

The total attendances at the 73 screenings of the mobile film unit were 6,300.

Equipment has been delivered to 10 farms which are being used to demonstrate the value of cooling of milk for cheese manufacture by means of a water-cooling tower of the type shown in Plate 2 (page 37).

The sum of £87 10s. 4d. was refunded as rebate of freight on eight pedigree bulls imported into Queensland from other States.

The Queensland edition of *Dairy Farming in Australia,* a handbook produced from money allocated from the Dairy Industry Efficiency Grant, has been distributed to all dairy-farmers in the State. It has been very favourably commented on and certainly provides an informative handbook on dairy-farming under Queensland conditions. Officers of the Department contributed most of the material for the Queensland section of the book, which covers all aspects of dairy-farming under Queensland conditions and forms the main part of the publication.

OTHER OBSERVATIONS.

There has been a strong demand for the purchase of dairy farms and dairy cattle at prices which have continued to rise. No doubt a factor influencing the purchase price of farms has been the present high costs associated with the development of unimproved land.

Divisional officers have co-operated with those of other Divisions in efforts to encourage a keener appreciation among producers of the necessity of conserving fodder on Queensland dairy farms. The failure of so many farmers to make provision for reserve feed supplies for herds during the seasons when pastures are inadequate to maintain production is evident in the serious decline in production which occurs every year during the winter months. The conservation of hay or silage to provide supplementary feed for at least three months is practicable on most farms; moreover, taking into consideration the losses in income and stock during the recent drought, it is evident that the industry cannot continue to neglect this phase of farming practice, which is after all routine on farms in almost all other countries.

Plate 1.—A Charcoal Cream Cooler on a Central Queensland Demonstration Farm.

Plate 2.—A Water-cooling Tower on a Dairy Farm in the Beaudesert District.

Plate 3.—Elevated Bails Built by a Central Queensland Farmer.

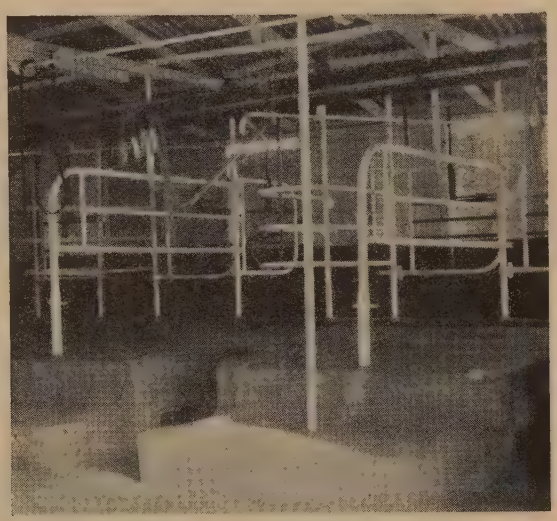


Plate 4.—View of Elevated Milking Bails.

Plate 5.—All-metal Bails installed on a Gympie District Dairy Farm.

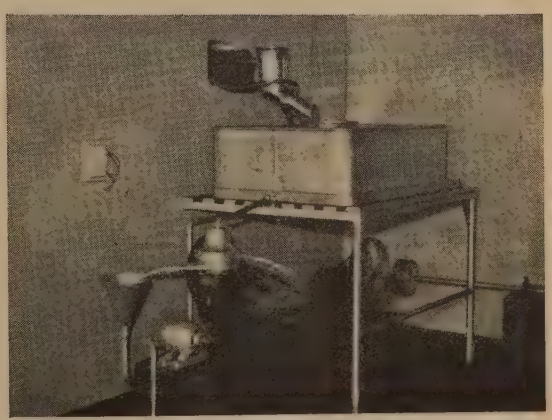


Plate 6.—The Separator Room of a Modern Dairy Building.

Plate 7.—A Modern Milk-Sampling Device at a Queensland Milk Factory to Facilitate Regular and Accurate Sampling for Methylene Blue and Fat Tests.

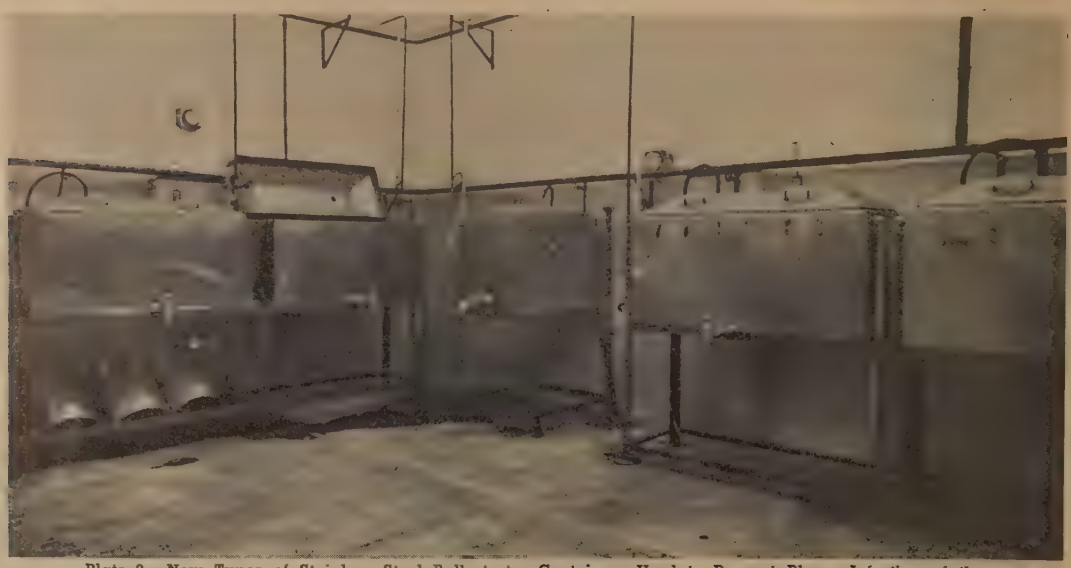


Plate 8.—New Types of Stainless Steel Bulk-starter Containers Used to Prevent Phage Infection of the Starter at the Cheese Factory.

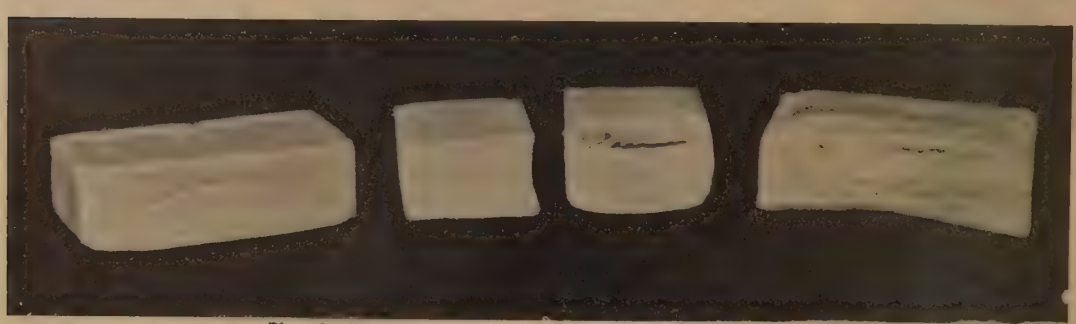


Plate 9.—Processed Cheese (right) infected with *Bacillus mycoides*.

Plate 10.—Pump Designed to Measure Rate of Air-flow for the Determination of Phage in Air at Cheese Factories.

Plate 11.—An Isolated Starter Room at a Queensland Cheese Factory. Note the filtered air intake vent at the right which in addition steam-sterilises the filtered air.

It is candidly admitted by many producers that the existing small margins between the prices of choice cream and lower grades are not conducive to continuous striving to maintain dairy-shed practices at the highest efficiency, taking into consideration the additional cost of equipment and cleaners and the time involved. This attitude is hindering the efforts of Divisional officers to improve milk and cream quality.

The acute shortage of materials, particularly galvanised iron and cement, is another factor which has prevented many farmers from carrying out renovations to their dairy premises, but despite this, steady progress has been made in bringing dairy buildings and equipment into compliance with Departmental requirements. Refrigerators to enable efficient cooling of milk and cream on the farm were installed on an increasing number of farms, and even more progress in this direction would have been made but for delay in manufacture and delivery of the necessary equipment.

Factory managements are still finding difficulty in obtaining sufficient numbers of trained factory operatives possessing the certificates of proficiency issued under the Dairy Produce Acts. Although the correspondence courses now available from the Brisbane Technical Correspondence School are useful in assisting factory employees to qualify for the various certificates, it would be advantageous if short courses were available at an appropriate institution to supplement them.

Amendments to the *Dairy Produce Acts* were made during the year. The definitions of "factory" and "depot" were altered to conform with changing practices in the industry. Pasteurisation was defined and provision made for the taking of samples for examination. The use of electric water-heaters on dairy farms equipped with milking machines was approved. Milk and cream can now be purchased by factories on different bases according to the specific purposes for which they will be used. Provision was made for separators to be used in certain types of factories where separation is an integral step in the processing of products. The section prohibiting canvassing for milk and cream supplies was altered to permit processed-milk factories to obtain supplies of milk.

In September, 1951, quotas for the manufacture of table margarine were raised from 645 tons to 1,600 tons yearly on a proportionate basis for the three firms which have been granted quotas to manufacture table margarine.

LABORATORY CONTROL SERVICES.

Routine laboratory examinations of dairy products, water, and farm and factory requisites were made. These included samples from 1,516 churnings of butter under the Butter Improvement Service, 950 butters for acidity determinations, 996 samples of various kinds for chemical analyses, and 17,427 tests on milk in connection with the Milk Quality Control Scheme. In addition, 29,866 fat tests and 81,514 methylene blue tests were carried out by milk-factory staffs for the purpose of maintaining milk quality. Pieces of dairy glassware tested for compliance with the standards prescribed under the *Dairy Produce Acts* for apparatus used in factories numbered 15,839.

Some 710 cheese-starter cultures were distributed; they included special phage-resistant starters supplied to factories which have experienced bacteriophage interference with normal acid development during cheese manufacture.

Visits made to cheese factories for the purpose of investigating factors affecting manufacture and quality totalled 23. The data being obtained from analyses of cheese, coupled with factory surveys, are being assembled for the purpose of studying the factors influencing cheese yields and quality under Queensland conditions.

Visits made to city and country milk factories for the purpose of conducting bacteriological surveys and investigating processing methods numbered 71, and 37 visits to butter factories for specific advisory purposes were made.

There has been an expansion in the drying of buttermilk and skim-milk by the roller process in recent years. Routine analyses of these products have assisted in improving the quality and have also enabled factories to minimise avoidable losses of butterfat in buttermilk during the processing and churning of cream at factories.

Weekly visits have been made to certain selected farms where demonstrations of improved dairy hygiene and milking techniques are in progress. The results of the laboratory examinations have been used to evaluate the efficiency of various single and mixed detergents and chemical sterilants and to assess the relative importance of various utensils and milking procedures as sources of contamination during milk production.

Many farm water supplies in Queensland are hard; such waters interfere with the proper use of detergents unless they are conditioned. Following analyses of waters in the laboratory, advice on effective softening treatment has been given to farmers. This has enabled economies to be made in the use of cleaners, reduced milkstone deposits on equipment and extended the life of the equipment. Model treatments have been developed on a number of farms for demonstration purposes under the Dairy Industry Efficiency Scheme. Tests have also been carried out in connection with cleaning milking-machine rubberware and extending its useful life, and on a vacuum regulator and milk-flow indicator for use on milking machines to improve the efficiency of machine-milking.

Advisory services concerning chemical engineering problems have been mainly associated with the design and layout of factory water-treatment plants, fuel and boiler-station economy, cooling of milk and cream, refrigeration capacity, and can- and bottle-washing detergency.

Emphasising the industry's appreciation of the laboratory and technical services of the Division, requests for the establishment of branch laboratories at Murgon and Malanda to cater for the needs of factories and producers in the Burnett district and North Queensland, respectively, were made. Approval for both laboratories has been given. It is anticipated that the Murgon laboratory will be staffed in

November next and the Malanda laboratory early in 1953. They will provide factory control and advisory services in connection with milk and cream production and quality and the processing of all forms of dairy produce. Investigations on special district problems will also be undertaken.

INVESTIGATIONS.

Studies on the decline in the fat percentage of milk during the winter months—a problem of concern to milk-distribution factories in complying with the minimum legal fat standard at this time of the year—have been continued. It has been noted from a short-term experiment that an appreciable improvement is obtained from the feeding of long hay even if of low protein content, and in the ensuing year it is proposed to extend the investigation to at least three large herds and one set of identical twin cows.

An investigation aimed at evaluating the efficiency of various detergents and chemical sterilants was completed during the year and a paper prepared for advisory purposes. In conjunction with these tests the degree of contamination taking place from the various pieces of equpiment used on farms was determined. It will be noted from the report of the Research Branch that the investigation disclosed the actual technique of cleaning to be more important than the type of detergent or sterilant used. The major sources of contamination were the milk vat, cooler and milk can.

A method for using the microscopic appearance of butter as an index of the efficiency of the working process during manufacture has been developed and is now being used as a regular test under the Butter Improvement Service to assist factories to control the body and texture of butter, an important factor in producing butter of good keeping quality.

Failure to control the percentage of butterfat in the butter milk can represent an appreciable economic loss to a butter factory, and studies are in progress with a view to determining the factors mainly influencing such losses and methods for their control. A number of trials at factories have shown that fat losses during manufacture are higher when more intensive treatment is given cream during pasteurisation, but by churning cream with a fat percentage not lower than 35, by avoiding excessive dilution with water during all stages of processing, fat losses can be reduced.

The investigations on the keeping quality of butter, commenced three years ago, indicate that important criteria of keeping quality in cold storage are the pH of the butter serum and the copper and iron content of the butter. It is therefore important that care be exercised at factories to ensure strict control of residual acidity in cream after neutralisation and to minimise metallic contamination during processing by maintaining any tinned equipment in good condition. Well-tinned farm utensils are also necessary to avoid traces of iron becoming dissolved in milk or cream.

Suggestions that the extended use of new tickicides may be a factor contributing to the degrading of butter have been made, but trials in which these compounds were added to butter in much higher concentrations than are likely to occur in practice have shown no effect on the initial flavour score or the keeping quality of butter.

Preliminary trials at cheese factories have indicated the apparent success of using phage-resistant starter cultures for cheese manufacture, and although it is not possible at this stage to predict whether these starters may ultimately lead to a new approach to the problem of controlling bacteriophage, the results are promising, and accordingly the investigation is being accorded a high priority in the Division's research programme.

Two defects—putrefactive blowing and white spot—caused financial losses in processed cheddar cheese during the year. The causal bacteria of each defect have been isolated and control measures developed. Papers dealing with these defects are being prepared for publication. Control depends primarily on good farm and factory hygiene.

The survey of farm and factory water supplies has been continued, a further 321 samples of water having been analysed and treatments determined experimentally. It is becoming increasingly evident that farm water supplies frequently require treatment for effective use with dairy cleaners, and that a properly conditioned water supply is also essential at factories in order to avoid certain defects in dairy produce and to reduce boiler troubles, fuel loss and damage and corrosion of equipment.

STAFF.

One officer of the permanent staff was retired under the age provisions, seven officers resigned and 12 officers were recruited, giving a net gain of four. The staffing of several important dairying districts which had been without a resident service from the Division for some years was possible as a result of the increase in the number of field officers. Despite the numerous other duties performed, particularly in connection with the Dairy Industry Efficiency Grant, the average number of farm visits per officer exceeded 50 monthly. A high proportion of the field staff has been recruited since 1945 and the staff generally is now providing a strong service for the dairy-farming section of the community.

Two officers who returned to the staff last year after training in New Zealand have enabled a strengthening of the services given to factories. They are giving specialised attention to problems of manufacture of butter and cheese.

Six papers were contributed to the *Queensland Journal of Agricultural Science* and other scientific journals, and 12 to the *Queensland Agricultural Journal*. In addition, the work of the Division was brought before farmers and factory personnel by means of radio talks, field days, the Factory Managers' Conference and other means.

During the Director's absence in Pakistan for about three months, carrying out a mission under the Technical Co-operation Scheme of the Colombo Plan, Mr. L. E. Nichols (Director of Research) directed the work of the Division.

DIVISION OF MARKETING.

Mr. H. S. Hunter, Director of Marketing.

A most significant trend in the marketing of agricultural produce during the year was the extent to which prices, rising from the pressure of increasing costs, encountered consumer resistance. Consumption in some cases fell off sufficiently to force reductions in price. Other marketing difficulties experienced arose from shortages due to the effects of drought which, commencing in the previous autumn, extended over the winter, spring and summer months. Wheat, butter, cheese, milk, eggs and green vegetables, commodities normally in surplus supply, all had to be imported in some quantity to supplement inadequate State production. Over the last autumn period the market for green vegetables slumped rather badly as extensive plantings made after the breaking of the drought in February reached maturity, but after the disposal of these initial plantings the market rapidly recovered to the higher prices which have been the norm of recent years.

WHEAT.

The current wheat shortage, which has necessitated the importation of some three million bushels of South Australian wheat, is entirely the result of adverse seasonal conditions, as, in contrast to the position in most of the larger wheat-growing States, the acreage under this crop in Queensland is increasing. After approximately 10½ million bushels were produced from an area of 462,240 acres in 1947-48, the area in the two succeeding seasons was increased to beyond 600,000 acres. It is now estimated that after the past two seasons of adverse weather conditions, this year's planting of wheat will reach a record of 730,000 acres.

The upward trend of wheat production, the high cost of sacks and the scarcity of labour have been potent factors in suggesting to the minds of many persons associated with the wheat industry that the adoption of a bulk-handling system for wheat is now a necessity. This view has been strengthened by an appreciation of the possibility that in circumstances of emergency Australia could be cut off from supplies of jute goods.

Following upon the collection of information by the Marketing Division from other States of Australia where bulk-handling systems for wheat have been established, and an examination of the question by an inter-departmental committee, the State Wheat Board is proceeding with the erection of a bulk-handling terminal, with storage for half a million bushels of wheat, and loading gantry at Pinkenba; the Railway Department is procuring railway wagons suitable for the carriage of bulk wheat, and some individual wheat growers have installed on their farms the mechanical equipment needed for the handling of wheat in bulk from the header to the point of delivery to the Wheat Board. Meanwhile the Australian Wheat Board is establishing in Queensland bulkhead type structures of a temporary or experimental nature at Pinkenba, Dalby and Oakey, to cope with a possible record crop of wheat this season.

The history of wheat-growing in this State shows that crop failure in some degree may be expected in 10 years out of 30. The permanent terminal at Pinkenba, therefore, is to be so constructed that it may be utilised for the import as well as for the export of wheat.

TOBACCO LEAF.

The 1952 series of auctions of tobacco leaf have provided some unpleasant shocks to growers who, encouraged by the prices paid for leaf in the previous season and the satisfactory clearance of all grades, increased their production, and to new growers who were attracted to the industry. The area planted to tobacco increased from 4,142 acres in 1950-51 to an estimated 5,200 acres in 1951-52. The opening series of auctions at both Mareeba and Brisbane have resulted in over 24% of offerings being left unsold, and a lower average price was paid for the better grades of leaf (a proportion of which was included in the unsold offerings) than was the case in the previous year.

This sudden check to the industry was unexpected in that it occurred against the background of the Commonwealth Government's import restriction policy under which the import of manufactured tobacco and cigarettes was cut by 80%. In recent years, owing to the dollar position, the usage of Australian tobacco leaf in the blends of Australian manufacturers was so much in excess of the prescribed 5% for tobacco mixtures and 3% for cigarettes that those percentages had become quite unrealistic. It is worthy of note that cigarettes imported into Australia increased from 582,101 lb. in 1946-47 to 10,594,207 lb. in 1950-51, and totalled 8,298,705 lb. for the first six months of 1951-52.

The Commonwealth Department of Commerce and Agriculture has ordered a special investigation to ascertain whether the cause is an undue proportion of low-grade leaf, or a lack of competition by manufacturers.

The Tobacco Leaf Marketing Board proposes that, at the termination of the current selling season, representatives of the manufacturers, the Board and growers' organisations should meet in a round-table conference to define the grades of leaf which should be eliminated from the auction floors.

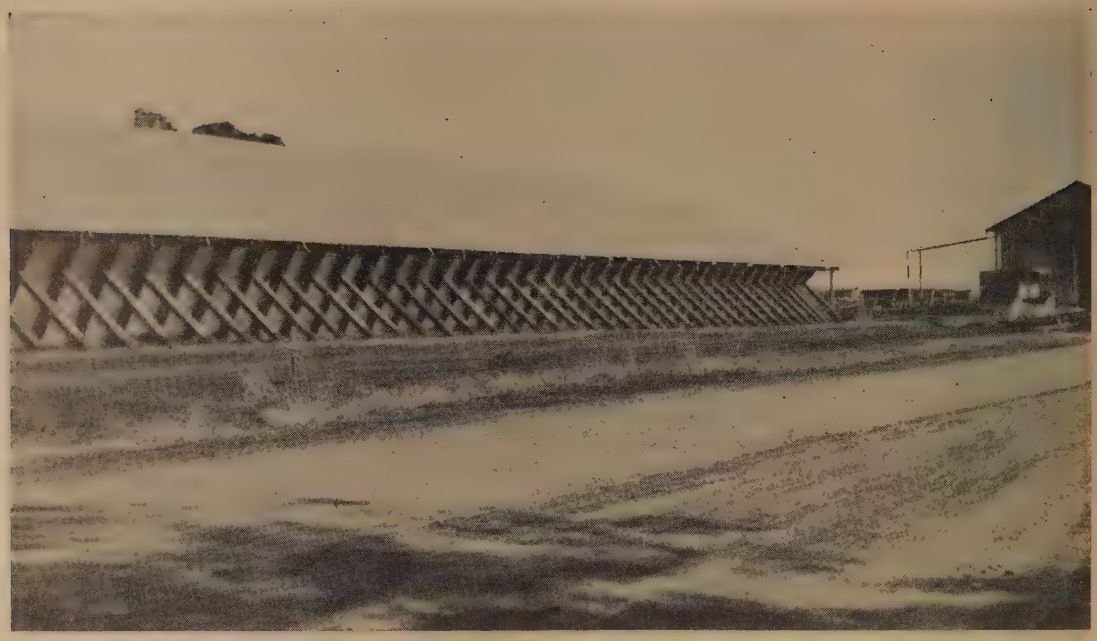


Plate 1.—The Bulkhead Store at Oakey. Its capacity is 100,000 bushels; external measurements 239 ft. x 64½ ft.; the structure has 13 bays.

Plate 2.—The Bulkhead Store at Oakey in Course of Erection.

Plate 3.—Interior of Bulkhead Store. The centre poles are 17 ft. high; the floor is lined with bituminous sheeting.

Plate 4.—A Screw Conveyor Transferring Bulk Wheat to a Railway Truck.

MISCELLANEOUS.

In view of the failure of onion-growers to support the Onion Marketing Board during the past two seasons, the Government has decided not to extend its operations after the end of its term in July. The Board will therefore expire by effluxion of time on July 20, 1952. The Board was inaugurated in July, 1949.

The experience in the past year of having to import probably 3½-4 million bushels of wheat before the next crop is available points to the necessity for a carry-over of grain at the end of each season. Especially is this seen to be so in the light of the current campaign for the increased production of foodstuffs. Of the coarse grains, Queensland normally grows only sufficient for its own requirements of stock feed, plus some over-the-border sales. Although production has not materially increased, considering the growth of population, any suggestion of a carry-over supply would be difficult to arrange because of the pressure each year to secure export permits for the surplus. The higher-priced export market for grains has in fact been so attractive that production of foodstuffs in the pig and poultry industries has been declining. Profitable export of feeding grains may consequently be viewed as of doubtful value either to the agricultural industries or to the country as a whole.

In 1951 Parliament amended *The Primary Producers' Organisation and Marketing Acts* to prescribe additional duties for marketing boards in relation to their obligation to supply the commodity marketed by them for the needs of consumers in Queensland.

The various services provided by the Marketing Division (for example, crop forecasts, reports on production trends, and market prices) have continued to give satisfaction. As recorded in the Marketing Branch report, plans for the improvement and widening of these services are under consideration.

STANDARDS.

In the Standards Branch, administrative work will be streamlined considerably by the passing during the last session of Parliament of *The Agricultural Standards Act of* 1952. This Act consolidates and brings up to date *The Seeds Acts,* 1937 *to* 1941, *The Fertilisers Act of* 1935, *The Pest Destroyers Act of* 1939, *The Veterinary Medicines Acts,* 1933 *to* 1938, and *The Stock Foods Acts,* 1919 *to* 1935. Consolidation will make for uniformity of registration and eliminate difficulties where preparations serve a dual purpose, such as fertilizers containing pest-destroying substances, etc. Averment clauses are brought up to date and warranty clauses are embodied in the Act instead of specific warranties appearing on invoices. Registration fees are simplified and uniform for all preparations. Fees for licences to sell fertilizers and veterinary medicines are eliminated. New materials coming on the market, such as sheep-marking preparations, repellents, growth-regulating substances, etc., will be controlled.

A Board consisting of seven officers of the Department reviews the claims of efficacy made by sellers. The Board may recommend the cancellation of the registration of any preparation where it is considered such is no longer efficacious. Claims made in advertising matter must be confined to the claims approved by the Board. A primary dealer has the right of appeal to the Minister where he feels he has a grievance against the action of the Standards Officer in refusing to register or in cancelling the registration of any preparation.

A Seed Certification Committee of not more than seven officers of the Department is constituted; such committee is assisted by various sub-committees for implementing schemes for the certification of seeds and parts of plants.

During the year a serious falling off in the quality of prepared stock foods has been noted due to the shortage of protein concentrates, particularly meatmeal. This shortage is one of the troublesome factors limiting food production.

Experiments covering the storage of vegetable seeds over a four-year period have given a lead to interested parties in avoiding the considerable losses which occur under the somewhat difficult conditions prevailing in Queensland. The use of airtight containers stored under refrigeration is suggested.

Adverse weather conditions have impeded the work on seed certification, but the high standards set under the various certification schemes have been maintained. The demand from dollar areas for grass seeds has not been fully met. The export of grass seed has dollar-earning possibilities, provided due regard is given to the insistence of the importing countries upon a high standard of purity and germination.

STAFF.

A careful selection of projects on a priority basis and a system of understudies have done much to mitigate the effects of staff shortage which has affected the Division no less than other parts of the Service in post-war years.

However, functions naturally expand and demands on services increase in a developing country. In the Standards Branch particularly, functions have had to be curtailed to a degree which has given cause for some concern. Appropriate suggestions have been made which are designed to overcome these disabilities.

Mr. A. J. Everist, Registrar of Primary Producers' Co-operative Associations, was during the year appointed to represent the Department on the Co-operative Advisory Council which was established under *The Co-operative Societies Act Amendment Act of* 1951.

REPORTS OF BRANCHES.

DIVISION OF PLANT INDUSTRY.

AGRICULTURE BRANCH.

Mr. D. O. Atherton, Director of Agriculture.

The 1951 drought continued until the early months of 1952. Seasonal conditions then took a turn for the better and rainfalls were well above average for each month from March until June in all the principal agricultural districts.

SOIL CONSERVATION.

Fortunately, the drought-breaking rains of February and March were mostly of harmless intensities and no widespread erosion was caused, even though much of the pasture land as well as cultivated land was then in a highly vulnerable condition. However, extensive damage occurred on sugar cane fields in the South Isis area, where 17 inches fell in three days, seven inches falling in the last three hours of the period. Very serious erosion resulted in areas in fallow or under young plant cane, where estimated soil losses ranged up to 400 tons per acre, but forward cane afforded considerable protection. On the Darling Downs, in the Burnett, and on the Atherton Tableland some widely scattered, high-intensity storms caused severe erosion on finely worked crop land in restricted areas.

Active interest in soil conservation is increasing and a record number of over 300 requests for assistance and advice was received during the year. Some of these were from areas in which conservation farming has not yet been practised, and it is expected that the initiation of this work will stimulate an increasing interest in soil conservation in these areas. Altogether over 900 farmers throughout the State have sought the assistance of the Department's soil conservation service in recent years.

Mechanical-control measures were laid out on approximately 4,500 acres of arable and pasture land during the year. These works afford protection also to considerable areas of land lying further down the slopes. Large areas have been given some measure of protection by improved land-usage practices, and particularly by the establishment of pastures on formerly cultivated land. The principles of correct land usage, particularly agronomic practices designed to maintain soil productivity, are continuously stressed by soil conservation officers, and progress in this field has been steady. Over 60 new conservation farm plans were designed to provide for the future layout of the farm and take into full account the potential land-use capabilities of all parts of the farm. Progress is further exemplified in that stubble-mulch farming is now a well-established practice on the Darling Downs and is growing steadily in the South Burnett and Atherton Tableland districts. In addition, in the last two areas the benefits of crop rotation are receiving growing recognition, with an increasing appreciation of the value of grass leys.

Legislation.—A notable advance during the year was the introduction of legislation to provide for the conservation of soil resources and the mitigation of erosion. A feature of the legislation is that it provides a means for an approach to the erosion problem on a catchment basis. In the important agricultural areas of the State the general topography is such that the most satisfactory method of applying conservation measures is to plan on a catchment basis, and the introduction of suitable legislative machinery now makes this practicable. An Advisory Committee has been set up under the Act to advise on conservation measures and to co-ordinate the activities and responsibilities of the various departments and instrumentalities concerned with the implementation of major conservation projects.

Two applications to have soil conservation projects designed on a group or catchment basis have so far been received from farmer groups. The areas concerned are of 5,000 and 7,000 acres, and are largely agricultural land. The areas have been inspected, some preliminary surveying work has been carried out, and a contour map for one of them is in course of preparation.

Demonstration Areas.—Earthworks construction on the existing Darling Downs series of demonstrations was completed during the year and future work here aims at developing a planned system of land usage based on agronomic principles and the capacity of the land. Progress on these lines has been very satisfactory owing to the enthusiasm of the co-operating farmers; permanent pastures, crop rotations (including pasture leys), and contour cultivation with stubble-mulch farming are now routine cultural methods. Construction works are incomplete on most of the demonstration areas in the Upper Burnett, and the demonstration farm on the Atherton Tableland has been abandoned because of the inability of the new owner to proceed.

The 20 established soil conservation demonstration farms have given very gratifying results, and as farmers show a keen interest in their development they are very useful in promoting soil conservation work.

A field day attended by approximately 800 visitors was held on a demonstration farm at Cambooya in August and soil conservation measures were also highlighted at several other field days.

Field Investigations and Research.—The investigation and research programme was continued at Hermitage and Kairi Regional Experiment Stations. Further exploratory work was conducted at Maroochy Horticultural Experiment Station and new work initiated in the Childers and Redland Bay districts.

At Hermitage, the development of suitable portable apparatus to measure run-off and soil loss is proceeding. The original design has been altered to include a Geib multislot divisor plate, which is the standard measuring equipment in use in the U.S.A. and New South Wales. Early tests of the plate have shown some defects, but it is expected that these will be remedied after further trials. The stubble from the 1950 wheat crop was very light and the 1951 stubble-mulch trial was virtually reduced to a comparison of yields under different tillage methods. Wheat yields from deeply ploughed plots (30.26 bush. per acre) significantly exceeded those from the stubble-mulch plots (25.28 bush. per acre) and the undercut plots (23.62 bush. per acre). Kikuyu and Kafue Rhodes grasses have proved the most aggressive of the grass species planted in the experimental waterways, but neither was able to compete successfully with invading species of grasses and legumes. Data from the uniformity trial with wheat on the land-use trial area showed a high degree of variability in soil productivity following the grading of the area. A green-manurial cropping programme will follow for another year in an attempt to level out the variations. Observations of rainfall penetration in the soils showed much variation, which appeared to be related to soil types, previous cropping history, and degree of cracking of the soil surface.

Plant species (including kudzu) which might be of value in soil conservation, particularly in stabilising gullies, are being investigated on the Darling Downs. Various types of structures to stabilise gullies are also

being investigated. The evidence so far indicates that the earth check dam will prove the most efficient structure and have the additional advantage of low cost.

At Kairi, observations on run-off under various cropping programmes are planned and attention has been given to the design of weirs suitable for installation at the outlets of contour banks. Further investigations relate to stubble-mulch farming and contour-bank spacings.

Exploratory projects at Maroochy Horticultural Experiment Station on steeply sloping pineapple-growing land are designed to evaluate the effect of different practices on reducing soil losses and on water drainage within the soil, and the effect of different row gradients on growth. In some small-crop districts in the south-east of the State some projects have been initiated in which straight interception banks are used in lieu of the orthodox contour banks to provide for the Skinner-type spray lines which are in general use in these districts. Other projects have been initiated in the sugar-cane areas of the Childers district, where slopes of up to 20% are cultivated. The design of suitable structures for these slopes has obvious difficulties and is often further complicated by harvesting procedures.

AGROSTOLOGY.

The devastating drought once more emphasised the fact that pasture is our cheapest and most important crop. Linked with this lesson is the knowledge that whenever grass fires sweep the countryside, thousands of tons of good feed, roughage or simply soil cover, depending on the condition of the grass at the time of firing, have been destroyed and lost to the nation.

It must be realised, however, that in this State the economics of grass hay conservation are still under investigation. There are, for instance, the large tracts of ringbarked country in Central Queensland, carrying black spear grass, where burning seems to be the only suitable treatment once the grass has dried off. On the other hand, it is well to remember that in the 15-inch rainfall country near McKinlay, 10,000 bales of bush hay were harvested in a little over 77 working hours from grassland yielding only 14 cwt. per acre. This hay, consisting mainly of Mitchell grasses with some Flinders and button grasses, was equivalent to fair quality Sudan grass hay or Rhodes grass hay in feeding value and showed virtually no deterioration after being stored in stacks for more than 12 months. In Queensland there are thousands of acres of Rhodes grass pastures, free from stumps, which would be expected to yield more than a ton of hay per acre. The conservation of this fodder each year is now mechanically possible and would greatly reduce drought hazards in these favoured areas. Evidence is also accumulating that where Rhodes grass has been grazed and mown rather than burnt, the soil has benefited from the accumulated mulch. On the Darling Downs, heavy soil under unburnt Rhodes grass did not crack during the drought and had sufficient moisture to carry some clover growth through the dry winter and spring of 1951. On plots bare of mulch following fires, the soil cracked badly and supported no clover growth. These observations point the way to the use of light discings to break down ungrazed grass as an alternative to firing on improved grasslands.

One beneficial effect of the prolonged rainless period was the accumulation of nitrogen in the surface soil, and when useful rains fell, pastures grew at a phenomenal rate in most parts of the State. This was particularly noticeable in the Rhodes grass pastures. However, in some areas, such as the Mary Valley, the rains came too late for the paspalum and kikuyu to make really good growth before the onset of winter.

Green panic and buffel grass (Plates 1 and 2, page 17) have again widely demonstrated their superior drought-resistance as compared with Rhodes grass, but the last may be better suited to the very heavy clay soils of parts of the Darling Downs and must still be considered our major sown pasture grass. The most adaptable grasses of which seed is available commercially are Rhodes grass, green panic and buffel grass; the last is proving of real value in the far north-western parts of the State. Reports on numerous pilot plots on many different soil types indicate that new strains of each of these grasses may be superior to those now in common use. Molasses grass gives a quick cover to protect soil and compete with weed growth, and it must be recognised as particularly valuable in some coastal areas, owing to its ability to thrive on eroded soils and in rough country. Lucerne is still potentially the most important pasture legume for the State and may be included in sowings with any grass. Feeding trials with another legume, phasemy bean (*Phaseolus lathyroides*), are being carried out by the Division of Animal Industry.

Interest in irrigated pastures and fodder crops was stimulated by the drought, but a major handicap to the establishment of irrigated pastures is the high cost of spray irrigation and the difficulty of hiring earth-moving equipment for grading land intended for bay irrigation.

A total of 86 trials is now being conducted on dairy farms throughout the State, although the drought delayed the establishment of several pasture plots. Many new strains of pasture plants have been distributed to the Regional Experiment Stations and district pilot plots for observation. Considerable attention has been paid to the use of diluents in the planting of pasture mixtures with standard wheat-planting machinery, and an article dealing with this subject is in course of preparation. Large-scale grazing trials are very important in the pasture work and three trials totalling some 40 acres are now in production. Indications are that very considerable increases in butterfat yield may be expected from at least two of these plots, which are all based on results obtained from smaller exploratory trials.

Pasture Introductions.—Some 112 species, of which half were legumes, were planted during the year. Seed of the better native pasture species is being collected for planting in trial plots, and selections from naturalised white clover paddocks are being retained under observation.

An erect form of Townsville lucerne which originated from a field selection made in the Dayboro district in south-eastern Queensland may be of some importance. In trial plots, this strain is combining much better with native grasses than the commercial form.

Exploratory Plots.—The 24 small pilot plots which are established in the main agricultural districts are yielding valuable information on the adaptability of various pasture species. Outstanding in this respect are strains of three important grasses—green panic, buffel grass and Rhodes grass. Seed samples have been distributed to a large number of graziers in all parts of the State, while a pilot plot of grasses and legumes has also been planted in the fine-wool, traprock country of the Stanthorpe district. Where it is considered necessary, fertilizer treatments are applied to exploratory plots so that some indication of plant response can be obtained. It is from the results of these initial trials that the large-scale fertilizer treatments on the grazing trials are based. It has also been found that whenever stock are admitted to these trials, they always graze the treated areas much more heavily than the controls.

Grazing and Persistence Studies.—Drought conditions restricted the establishment of grazing trials. However, two trials in the Mary Valley have given yield increases on initial grazings, and other trials at Nambour, Peachester, Upper Caboolture, Pimpama and Chinchilla are now ready for grazing. This type of work represents a long-term programme and involves the use of fertilizers, cultural treatments, subdivision and, where necessary, pasture contour furrows.

Fertilizer Trials.—Work with trace elements in relation to pasture species has been commenced, with particular reference to legumes. The grazing trial on copper deficient pastures on the Near North Coast, being conducted conjointly with the Division of Animal Industry and the Chemical Laboratory, is now being prepared for stocking. This pasture is dominated by mat grass (*Axonopus affinis*), but has been improved by renovation with disc harrows and the application of lime and superphosphate. The problem of copper uptake by the pasture plants is discussed in the report of the Chemical Laboratory.

Pasture Management.—The value of contour furrows ploughed at vertical intervals of two to three feet has been widely accepted and active interest is being shown in the Logan and Albert and Brisbane Valley districts. In trials in the Mary Valley, stock showed marked preference for pasture growing along the furrows.

Trials involving mowing of bracken fern and blady grass, with a view to developing some method of control, have been commenced on the Atherton Tableland. Initial

depression of blady grass and regrowth of the original paspalum seem satisfactory. With dense bracken fern and blady grass stands, there is the problem of excessive mulch, which initially at least is preventing any grass establishment by oversowing. Where the existing grass is a poor species such as mat grass, it is desirable to be able to oversow a better species. This work is continuing, and additional treatments involving firing are being planned.

The suppression of mat grass by Rhodes grass at Peachester has been a feature of pasture work in this district. The unpalatability of mature Rhodes grass was offset to some extent by the effective drought reserve provided during 1951-52 by this grass.

Molasses grass continues to spread into the blady grass areas on the hillside pastures at the Bureau of Tropical Agriculture. Measurements are being made, but detailed results cannot be expected for several seasons; however, protection from firing is an essential part of the management.

Grass Yields.—Monthly yields of mat grass and blue couch grass are being obtained from test areas in south-eastern districts in order to give a picture of the growth periods of these grasses. The monthly samples of mat grass are being analysed in the Chemical Laboratory so that potential yield of protein during the year may be gauged. In the season under review, greatest growth was obtained between April 2 and April 29, when 1,606 lb. of dry matter per acre were produced, compared with 793 lb. in the preceding four weeks and 472 lb. in the succeeding month.

FIELD-CROP INVESTIGATIONS.

Wheat.

The wheat season of 1951 was in very marked contrast with that of 1950. Whereas the 1950 season was one of excessive rainfall and mild temperatures, the succeeding season was characterised by cold, dry weather. In spite of the drought, however, sufficient moisture from the previous summer was stored in most of the heavier soil types to bring winter crops through to maturity.

The main factors militating against a heavy wheat crop were (1) inadequate planting rains, (2) use of potential grain crops for grazing, and (3) inability of many crops to make full use of available soil moisture because the inadequate rains did not promote the development of a secondary root system.

However, some excellent crops were grown, and the yields testify to the value of a "season in the ground" in preparation for winter cropping. As the ripening period was warm and dry, crops were harvested under ideal conditions, and grain samples were generally of low moisture content, high bushel weight and prime appearance.

Two unusually severe frosts occurred, one in late July and one in August. They had little visible effect upon June-planted crops, which were in the early seedling stage, but crops planted earlier, having reached the late tillering stages, showed marked varietal differences in frost-susceptibility. Lawrence, a variety bred by the Department, was outstanding in its resistance to such frosting, showing only a slight tipping of the leaves under conditions which killed approximately two-thirds of Charter plants and approximately one-third of Warput plants. This feature of frost-resistance, particularly when coupled with a high degree of rust-resistance, greatly enhances the value of Lawrence as a dual-purpose variety intended for early planting.

The experimental programme included plant breeding, varietal and strain trials, fertilizer trials, and investigations of the causes and effects of mottling of the grain.

The highlight of the breeding programme has been the registration and liberation of the new hybrid selection TS.K.PF-4601 under the name of Spica. In four years of plot testing, Spica has shown high yielding ability and good gluten strength in addition to excellent field-resistance to stem rust. It gave an equally impressive performance in the dry season of 1951 as in the wet season of 1950.

The main result of the varietal trial series was that in the dry and rust-free season Gabo proved outstanding, in contrast with the bad showing made during the wet winter of 1950. In view of its partial susceptibility to forms of stem rust now prevalent, its reaction to a bad rust year (without the accompanying disability of severe waterlogging, as in 1950) has yet to be determined. Among the later-maturing wheats, Ford was outstanding, yielding 41 bush. per acre after heavy grazing by sheep for 23 days during June-July. Lawrence under the same conditions yielded 36 bush. per acre, but had a severe attack of stem rust occurred, Lawrence would certainly have outyielded Ford.

The fertilizer trial conducted on old cultivation in open-plain country near Mt. Tyson again showed no response in yield to nitrogen, phosphorus or potash. Thus, while there has been some response to superphosphate on the fringes of the Darling Downs, there is still no evidence of any response to fertilizer in the main wheat-growing areas.

Further evidence of seasonal effects on wheat mottling was obtained when, in contrast with the highly mottled wheat of 1950, a wet season, the 1951 grain crop was mainly hard and bright with little mottling. The nitrogen time-of-application trial showed a reduction in the percentage of mottled grain from nitrogen applied, either as sulphate of ammonia or as nitrate of soda, at any stage from planting to flowering. This contrasts with the previous year's work, in which only the later applications of nitrogen (at approximately the shot-blade stage) were effective in reducing mottling. These differences may be associated with seasonal conditions through light leaching in a dry season and heavy leaching in a wet season. None of the results counter the theory that nitrogen uptake is the principal factor affecting grain quality and freedom from mottling. However, even during a season which was ideal for grain quality, some mottling occurred despite the addition of nitrogen, thus suggesting that other factors may also be involved. No response to trace elements has yet been obtained, but further work on this aspect of the problem is planned.

As in past seasons, Branch officers collaborated with the State Wheat Board in the selection of seed-wheat areas to supply the bulk of the planting seed for the forthcoming season.

Oats.

The autumn-winter rainfall was inadequate for grazing oats in many coastal and sub-coastal dairying districts, and therefore such varieties as Vicland (formerly Victoria x Richland), Fultex (formerly Fulghum x Victoria) and Klein performed no better than varieties susceptible to crown rust. On the Darling Downs, soil moisture was ample for the production of good seed crops of the crown-rust-resistant varieties for use in 1952.

Grazing trials in dairying districts over the last few years have clearly established the value of crown-rust-resistant oats, and have created a tremendous demand for seed. Previously, Queensland depended mainly upon southern States for seed oats, but varieties such as Vicland, Fultex and Klein were not available there. Lately, seed of these varieties has been produced in quantity on the Darling Downs and in the South Burnett district, but so far production has not been able to meet the demand. Increased seed production is vital if full value is to be obtained from these excellent rust-resistant varieties.

Seed-increase of some BVH selections is now being effected in order to provide new varieties carrying a different type of crown-rust-resistance from that of Vicland and Fultex. This step will provide against the possible occurrence of new and more virulent forms of crown rust, and Victoria blight. Both Vicland and Fultex are highly susceptible to the latter disease.

During the autumn of 1952 satisfactory rains were received in all dairying districts and normal plantings of oats were made for grazing and for seed production.

Maize.

Because of the adverse effects of the season, many early-planted crops were cut for ensilage or green-feed. Little late planting was possible before January, and such crops ran a very serious risk of frost damage prior to maturity. On the Atherton Tableland the season was more favourable, and while dry weather affected some crops at tasselling time, a reasonably good yield is anticipated.

Seed-selection work by the Department on open-pollinated varieties in south-eastern Queensland has now ceased, and greater attention is being paid to production of hybrid seed and the testing of new hybrids. Each year the influence of hybrids is being felt in districts

further removed from the main centres of seed production. In the main seed-producing centre, the South Burnett, approximately 50% of the 50,000 acres under maize in the 1950-51 season was sown to hybrids. Earlier reports indicate that hybrids are better able to withstand dry conditions than the majority of open-pollinated varieties, and this characteristic has been amply corroborated during the current season.

Seed selection is continuing within the variety Durum on the Atherton Tableland. Durum yielded slightly less than the Atherfon Dent type in a trial carried out during the 1950-51 season but was more easily handled by the mechanical picker and produced a better sample of grain of a lower moisture content. If such results are repeated, Durum might increase in popularity in proportion as mechanical harvesting becomes more widely adopted.

The value of green-manuring with either cowpea or velvet bean before maize on the Atherton Tableland has been well established. In the past the only consistent fertilizer response has been to nitrogen, particularly on the lighter forest soils, but in the relatively dry season of 1951-52 there was little response in growth to sulphate of ammonia. The present recommendation is to apply sulphate of ammonia as a side-dressing to the young crop in the wetter seasons only, and use no fertilizer in dry seasons unless the young maize shows symptoms of nitrogen deficiency.

Sorghums.

In one or two favoured districts, such as the Bongeen area of the Darling Downs, spring plantings were possible, but the yields seldom exceeded 30 bush. per acre. More extensive plantings were possible in other sections of the Downs in late December and January, and in spite of early drought periods, some excellent yields were produced. In the Upper Burnett and Callide Valleys, December sowings were possible, but the crops depended greatly upon the soil moisture stored prior to planting. Most of the South Burnett crops were late and faced serious risk of frost damage.

The sorghum-breeding programme at Kingaroy was seriously handicapped by the dry weather subsequent to planting. However, a full range of progenies was grown, and even if frost affects the crop, some viable seed for the maintenance of all stocks is anticipated. A distinctive type of head is emerging from certain of the crosses, notably (Wheatland x Betty) x Wheatland, and Feterita x Early Sumac. This is a large, ellipsoid type of head with long branches and a far more open texture than those of the established varieties. Such heads have not the extreme openness of Coastland, but produce far more grain per head. Some of these selections are now uniform enough to bulk for increase and varietal testing next season. Testing of new selections from the cross Day Milo x Dwarf Kalo has been delayed by seasonal setbacks.

The regular provision of mother-seed for the planting of seed-certification areas of sorghum varieties has been continued. Small isolated pure-seed plots of sorghums are particularly subject to bird attack, and serious losses often occur. In order to overcome this difficulty, small seed lots direct from the Plant Breeder will be planted on Regional Experiment Stations whenever possible. The efficacy of seed certification in sorghums is to be checked by planting test plots from all sources of certified seed available in the previous year. The first of such plots was established this year on the Darling Downs, using ten 1951 seed sources representing six varieties. A comparison between various seed sources of the one variety will be obtained, and any serious shortcomings in production technique should be exposed.

During the 1951-52 season, Alpha, named and released by the Department only two years ago, was established as a major variety in all the important sorghum-growing districts. Its performance under difficult conditions has compared more than favourably with that of any other variety.

The results of sweet sorghum varietal trials conducted over the past three years in the Gympie district have shown that the varieties Honey and Jones are admirably suited to the district.

Sunflower.

During the harsh testing period of the 1951-52 season, sunflower proved itself one of the hardiest of our summer crops. While the acreage sown is still low in comparison with other crops, it is felt that sunflower may have an important future as a provider of a useful vegetable oil. Some measure of varietal testing and seed selection within established varieties therefore appears to be justified. Such work has received a temporary halt on account of the shortage of seed of such new introductions as Jupiter and Pole Star. Current efforts are therefore directed towards seed increase and improvement in uniformity within these promising varieties as a prerequisite to testing on a wider scale.

Linseed.

In the dry winter of 1951, stored soil moisture was adequate for most crops of linseed planted on the Darling Downs and yields of good-quality seed were very satisfactory. Little planting occurred outside this district, and even on the Downs the irregularity of planting rains caused a reduction in acreage below that originally anticipated. Linseed now occupies an important place in Darling Downs agriculture, and presuming the maintenance of a satisfactory price differential between it and wheat, may become a serious competitor of the latter crop, particularly on the lighter soils.

Walsh is still the only commercial variety grown, but new introductions and selections are being tested. A pedigree-selection programme is now in operation at Hermitage Regional Experiment Station, and some selections have, in their initial tests, yielded as much as 30% to 50% higher than commercial Walsh. Larger-scale commercial trials are required before any of these selections warrant release as new varieties.

A fertilizer trial carried out on heavy black soil at Bongeen indicated significant yield responses to sulphate of ammonia and to superphosphate. Sulphate of ammonia apparently induced an increase in the number of branches per plant, whereas superphosphate had no effect upon branching. Since the soil in this area is high in available phosphoric acid, it is possible that part at least of the responses obtained may have been due to the sulphur occurring in both fertilizers.

A rate-of-planting trial showed significant increases in yield for sowing rates of 20 lb. and 26 lb. per acre over the lowest rate of 14 lb. per acre. This is in contrast with results from the high rainfall season of 1950, in which no differences were obtained from sowing rates ranging from 10 lb. to 26 lb. per acre. At present, the Department is recommending a general seeding rate of 20 lb. per acre.

Soybean.

Over a series of years prior to 1951 a large number of introduced soybean varieties were tested in Queensland in anticipation of a possible commercial demand for this crop. In addition to local adaptation and yielding ability, suitability for mechanical harvesting was the main criterion used in selecting material for propagation. By the time definite enquiries were made for the crop, in the 1950-51 season, seed of four selected varieties was available for the establishment of small commercial plantings. Such farm plantings during the last two seasons have suffered serious depredations by hares and have reacted rather badly to seasonal hazards.

Peanuts.

The peanut crop in the South Burnett district suffered a severe reverse. Only a very small percentage of the anticipated acreage could be planted before the end of 1951, and the bulk sowings of January, 1952, were made too late for normal development. Good growing conditions and an enhanced acreage give promise of an above-average crop on the Atherton Tableland. However, as this district normally produces less than 5% of the State's total crop, its production this year will do little to offset the losses in the south.

Departmental officers have assisted the Peanut Marketing Board in the selection of fields for bulk seed production. Work has also been done in the increase of pedigree-selected seed-stocks of the two principal varieties, Virginia Bunch and Red Spanish. In addition, a series of recent introductions from South Africa and South America are being tested against local varieties for yield, quality and disease-resistance.

Cotton.

Interest in cotton-growing has recently been stimulated, owing partly to the greatly increased home price for seed cotton and partly to improved facilities for mechanical harvesting. Seed for planting 15,000 acres was applied for by farmers last season, but seasonal

conditions reduced the acreage planted to approximately 4,000. Normal spring planting was effected only in irrigation districts; in dry-farming dist icts planting was not general until January.

The Theodore district has recently been virtually a one-variety community, growing the Queensland selection 43.9.0 of the variety Miller, a type which is very suitable for machine-harvesting. Yields of more than 1,000 lb. per acre on the first pick are common, and a much smaller second pick will be available. In dry-farming districts crops are progressing reasonably well in spite of the late planting, and fair returns are anticipated. Twelve mechanical harvesters are now available, but a number of these will not be required for the current harvest.

One of the main objectives in the current breeding programme is the development of a plant structure suitable for mechanical picking. This is also important in varietal and time-of-planting trials in the Burdekin Valley, and in testing new varieties from overseas. Among recent introductions the most promising general-purpose variety is Empire, which has yielded well under both irrigated and dry-farming conditions and has produced lint of excellent quality.

Irrigated trials at Ayr in 1951 showed that yields of over 2,000 lb. of seed cotton per acre could be obtained. May plantings outyielded June and July plantings, and again the most consistent variety was Coker 100. A series of such trials indicates that the optimum planting time in this district is as soon as the end of the wet season allows.

Production of seed cotton in 1950-51 was nearly 1,500,000 lb., of which 29.5% was machine-harvested. The lint yield was 549,272 lb., giving a ginning percentage of 36.8. The ginning percentage for the State was 32.3 in 1922, 34 in 1935, and between 34.4 and 36.4 in the decade to 1950. This characteristic is subject to slight annual fluctuations, but the general improvement is attributed to many years of plant breeding by the Department.

Pumpkins.

Little winter planting was possible in 1951 except under irrigation in North Queensland and in a few frost-free locations in southern coastal districts. The main summer plantings were necessarily delayed until February, and good yields are being obtained from such crops. Much of this late crop will not find its way to the markets immediately, but will be stored on farms for stock-feeding or for late-winter sale.

The pumpkin industry in Queensland is based on one local variety known as Beaudesert or Queensland Blue. Other table varieties and cattle pumpkins are grown to a limited extent, but even for stock-feeding the Beaudesert type is most widely used. This variety is at present in a highly variable state, and purification of the best types within it is urgently needed. Work of this nature was initiated in 1948 and is still continuing.

Potatoes.

Most Queensland potatoes are grown under irrigation and production was well maintained in both the 1951 spring and 1952 autumn crops despite the drought. More frequent irrigations than usual were required, but few tubers rotted in the ground, except in the Bundaberg area, which produced the worst autumn crop for many years due to the high rainfall in March. In the Lower Burdekin the 1951 crop showed a big improvement over that of the previous year, when heavy winter rains caused widespread losses.

Changes in the popularity of varieties continue. Sebago has supplanted Factor as the dominant variety in south-eastern Queensland, while new varieties such as Sequoia and Exton are gaining favour. Bismark is the most widely grown variety in the Lower Burdekin, but Sebago has performed well and is likely to be planted more extensively.

Growers in southern Queensland import seed potatoes from southern States for planting the spring crop and retain seed from this harvest for planting the autumn crop in February. However, some difficulty is experienced in obtaining sufficient seed potatoes from the southern States for the Lower Burdekin in time for the customary April-May planting, and the practicability of using seed potatoes from the spring crop in southern Queensland is being examined. Seed potatoes of four varieties—Sebago, Sequoia, Factor and Exton (from Gatton)—were used last season. Two bags of each variety were held under barn-storage conditions near Gatton and two bags of each were held in cold-store in Brisbane from January till April 1952. Both lots were planted at Ayr in late April in a trial with Sebago and Bismark obtained through normal channels. In barn-stored lots, storage losses were very high, particularly in Sebago and Sequoia, and sprouting was prolific. On the other hand, the cold-storage lots were excellent, with negligible losses. However, sprouting developed quickly after withdrawal from cold-store and breakdown was very pronounced within four weeks.

At Ayr, in a 1951 varietal trial Bismark was the highest yielder, and whole seed gave distinctly better results than cut seed. There was a significant response to potash in a fertilizer trial. At Boonah, a fertilizer trial indicated that the optimum economic application of sulphate of ammonia in this area is 2 cwt. per acre. In the South Burnett, yield increases were obtained with applications of nitrogenous and phosphatic fertilizers.

Onions.

Because of the excellent prices, interest in onion-growing in 1951 was widespread and small sowings were made in a number of centres outside the main onion-growing area in the Lockyer Valley. Seed of Lockyer strains was very scarce and expensive (up to £3 per oz.) and therefore many farmers were forced to use seed imported from southern States. The southern varieties, planted from mid-May to mid-June, produced good bulbs and under irrigation yielded up to 14 tons of bulbs per acre. Unfortunately, they were late-maturing and the market was over-supplied at the end of the season. They kept well, when well-cured, the flat types being superior to the globe types in this respect. Production of seed of Lockyer strains in 1951 was much better than in the previous year. The adequacy of seed supplies enabled farmers to concentrate on early sowings of early varieties in 1952 and to curtail plantings of the late-maturing varieties.

In a variety x time-of-planting trial near Gatton the percentages of seed-stems and split bulbs within each variety increased with earliness of planting and decreased with late plantings. The superiority of the Lockyer strains of white and brown onions over varieties imported from southern States was again clearly demonstrated.

Lucerne.

The recent drought further emphasised the extraordinary value of this fodder crop. Heavy and frequent irrigations up to six inches in two applications per cutting were necessary in the Lockyer Valley, where vigorous young stands, cut once every three to four weeks in the warm months, produced at least one ton of hay per acre per cutting. Growth ceased in non-irrigated areas as the drought lengthened but quickly recovered when the rains came, and most stands were in good condition again by the end of May. The phenomenal prices paid during the drought were a great incentive to production of hay and chaff on farms where irrigation facilities were available. Dry conditions favoured harvesting and hay of excellent quality was produced. Increased plantings have been reported from many agricultural districts, but with increasing mechanisation lucerne can be used much more extensively in this State.

Experiments in the Lockyer Valley have shown the value of applying sulphur-containing fertilizers. In the Laidley Creek, Lockyer Creek and Tent Hill areas, yields have been doubled by the use of gypsum at the rate of 194 lb. per acre. Many farmers in these areas now fertilize lucerne with superphosphate, sulphate of potash or sulphate of ammonia. Where responses are obtained the effect is almost certainly due to the sulphur content of these fertilizers. However, potash deficiency has also been found along Laidley Creek and in this area both sulphur and potash appear to be required. At Theodore, also, lucerne has responded to fertilizers containing sulphur.

Tobacco.

Although most tobacco in Queensland is grown under irrigation, the drought caused a shortage of water and in many cases sufficient irrigation could not be given to obtain maximum production, particularly where acreage had been increased on individual farms. The adverse growing conditions were detrimental to leaf quality and

the influx of inexperienced growers also militated against the maintenance of quality. Transplanting from seedbed to field before September was again shown to be unsatisfactory in North Queensland.

Expansion in the Queensland tobacco industry, though marked, has been hampered by the prevailing shortage of building materials and increasing costs of production. In 1948-49, 1,678 acres were planted; 1949-50, 2,677 acres; 1950-51, 4,142 acres; and for 1951-52 it was estimated that more than 5,000 acres were under tobacco, yielding about 4½ million pounds of cured leaf. About 60% of the tobacco acreage is in the Mareeba-Dimbulah area and about 25% in the Inglewood-Texas area. The most marked expansion has occurred in the main areas, but expansion has also been recorded in the districts of Ayr, Ingham, Bundaberg and Bowen.

Recent developments in the Mareeba-Dimbulah district include a more active interest in contour planting and a test comparison of lighting kerosene with the normally used firewood as fuel in curing barns. The oil-burners were easy to operate, reduced fire risk, reduced labour and simplified barn-temperature control. Leaf cured by oil fuel was equal in quality to that cured by firewood, and with further experience, improvements can be expected.

Over 1,400 oz. of tobacco seed, produced under Departmental supervision, were sold to tobacco growers in 1951-52. Gold Dollar (700 oz.) was the most favoured variety in all areas except Townsville-Bowen, where Hicks was preferred. Of the remaining varieties, Virginia Bright Leaf and 400 were in greatest demand. Ample stocks of seed of all popular varieties are held, and in the past season production of seed was limited to about 1,000 oz. of Mammoth Gold.

Other work on tobacco is discussed under the heading of "Tobacco Experiment Farms."

JUTE AND ALTERNATIVE FIBRES.

Six strains of kenaf (*Hibiscus cannabinus*) were obtained during the year and planted for seed increase in centres ranging from Mareeba to Warwick.

Jute (*Corchorus capsularis*) and pink burr (*Urena lobata*) were grown on experiment stations in North Queensland for testing an experimental ribboning machine in co-operation with other organisations. Two sowings of jute were made at Ayr (December 11 and January 4) and one at South Johnstone (December 24-27). The pink burr was planted at South Johnstone on December 3-5 to allow for its slower-maturing habit. Optimum growing conditions were provided by applying fertilizer, irrigating and weeding as required. The ribboning machine was tested at Ayr during the period March 12-14 and at South Johnstone March 17-20. Treated crops varied from 6 ft. to 8 ft. high, with average stem diameters of ⅜ in. to ⅝ in. near ground level, and ample material was available. Thus the ribboning machine was fully tested under conditions which could be termed ideal. The machine is shown in Plate 7, page 18.

The machine when stationary separated the bark ribbons from the woody core quite efficiently. However, its contribution to reducing labour costs in the preparation of fibre from jute and pink burr was not good enough to suggest that the costs of production could be lowered very greatly. A joint report on jute and alternative fibre production in Queensland is being prepared in co-operation with the Division of Secondary Industries of the Department of Labour and Industry. Anticipating this report, it does not appear that the growing of jute or jute substitutes could be established in this State without direct financial assistance.

BUREAU OF TROPICAL AGRICULTURE.

Pastures.

The 6-years-old trial of pasture mixtures originally planted in ten 2-acre fields has been maintained and observations continue. The average daily liveweight gain per bullock for the period August 27, 1951, to May 26, 1952, was 1.03 lb., compared with 1.28 lb. for the corresponding period of the previous year. Only 15 beasts were grazed on the 20-acre trial, compared with 16 in the previous year. As the pastures made good growth throughout, this drop in beef production was disappointing.

(*a*) *Purple-top Guinea grass and centro.* Centro is tending to dominate the grass because the cattle graze the latter heavily. Common Guinea Grass has invaded a portion of one plot.

(*b*) *Molasses grass and calopo.* The stock relish the grass but not the legume, and in late autumn of 1952 the plots were well covered with grass. However, although the grass is dominant at times there are periods when it is completely smothered by the legume.

(*c*) *Common Guinea grass and stylo.* This mixture survives in one plot only. In the second one centro has been introduced by the grazing bullocks and has almost supplanted stylo. This and other observations confirm the suggestion that common Guinea grass and centro can be developed into a well-balanced mixture under good grazing management.

(*d*) *Molasses grass and puero.* Puero dominates this mixture, even though it is a palatable legume and is heavily grazed.

(*e*) The palatability trial plots of puero, calopo, centro, stylo and other tropical legumes have served their purpose and are now used to assist in providing the 28-day pause period between grazings of the pasture mixtures.

It is anticipated that grazing of the 10 pasture plots covering 40 acres at Utchee Creek will commence in August 1952. The pastures which have been established are (*a*) molasses grass and stylo, (*b*) molasses grass and centro, (*c*) Para grass, (*d*) molasses grass and Guinea grass, (*e*) molasses grass, (*f*) Guinea grass, (*g*) Para grass and centro, (*h*) Guinea grass and centro, (*i*) Guinea grass and stylo, and (*j*) Para grass and stylo. Growth has been prolific, but agisted stock have reduced the bulk of grass, thus allowing the legumes to develop more satisfactorily.

Further clearing at Utchee Creek is planned, and additional pasture mixtures will be sown so that all grass-legume combinations of the promising species available will eventually be under grazing trials.

Rice.

The available varieties considered worthy of further trial under non-irrigated conditions are now reduced to five—Tribulation, Early Niro, Mekeo, Prelude and Speculation. These were included in a varietal trial sown and grown without irrigation. Sufficient rain was received to ensure some grain yield, but high winds and heavy rains caused lodging, especially in weaker-strawed types.

Seed-increase areas were planted on January 2 and these were spray-irrigated in order to be sure of a crop. Harvest data are not yet complete, but observations indicate that Prelude will again yield reasonably well. Mekeo has also developed a heavy crop but slight lodging has occurred in this variety for the first time.

Tea.

The cool, dry weather in the winter months of 1951 interrupted the mechanical v. hand-harvesting trial, which was not resumed until flush occurred with the warmer weather in late spring. The first year of this trial has now been completed and data are being assembled. As has been noted previously, the overall quality of the tea declined during the cool months but improved considerably with better growing conditions in the warm months.

Trial results show that tea can be harvested mechanically with the electrically-driven Tarpen tea-cropper. A higher proportion of better grades was noted in hand-harvested tea, but the machine does not seriously impair tea quality. The cost of harvesting was in favour of the mechanical method, being about 3s. 6d. for the equivalent of one pound of commercial tea compared with 7s. with hand-harvesting. This is considered too high for commercial production in Queensland and the mechanical equipment at present in use does not appear to be the best answer to the harvesting problem.

With the object of developing a type of planting to suit mechanical harvesting, four hedgerow plantings of various sizes have been successfully established. Shade trees have also been planted among the hedges in a similar fashion to that adopted in tea gardens in tea-producing countries. Plantings of tea seedlings at Kairi Regional Experiment Station and on an area at East Palmerston, to supplement work at the Bureau, gave disappointing results, despite replanting and spray irrigation at the former centre. Further attempts to

establish these plots will be made next summer. Experience has shown that planting tea seedlings in the field is best carried out if done during the wet season.

Fibre-Plant Trials.

In small-scale observation plots, jute proved superior to pink burr, kenaf, *Sida rhombifolia*, sunn hemp (*Crotalaria juncea*) and Tossa jute (*Corchorus olitorious*). Jute does not make maximum growth in acid soils and in a small trial ground limestone at 3 tons per acre increased the yield to more than three times that from the unlimed soil. In another trial to determine the effect of time of planting on maturity, jute matured in 61 days when sown on February 26 and in 91 days when sown on November 30.

An attempt was made to harvest jute seed with a header-harvester. Fair efficiency could be obtained in a crop not exceeding 5 ft. in height, but even in short crops, seed losses might be appreciable. Other work on fibre plants is reported under the heading "Jute and Alternative Fibres."

TOBACCO EXPERIMENT FARMS.

1950-51 Trials.

Complete results, which were not obtained until the leaf was sold, are now available for the 1950-51 trials at both Mareeba and Clare Tobacco Experiment Farms. Although appraisal values have been used in assessing experimental results, auction prices often greatly exceeded appraisal values and are quoted in the result summaries to illustrate potential returns per acre represented by the different treatments.

TABLE 1.

ROTATION CROPPING—TOBACCO AFTER OTHER CROPS.

Treatment.	Yield of Leaf.	Appraisal Value.	Auction Price.
	Lb. per acre.	£ per acre.	£ per acre.
TMT ..	1,709	504	842
PRT ..	1,473	479	798
TTT ..	1,572	460	774
RTT ..	1,621	457	786
TRT ..	1,436	426	712
Average ..	1,562	465	782

T = Tobacco; R = Rhodes Grass; P = Peanuts; M = Maize.

TABLE 2.

TOBACCO VARIETAL TRIAL.

Variety.	Yield of Leaf.	Appraisal Value.	Auction Price.
	Lb. per acre.	£ per acre.	£ per acre.
402	1,677	428	759
Yellow Mammoth	1,376	383	668
Yellow Special ..	1,382	372	654
Hicks ..	1,418	357	635
Gold Dollar	1,284	359	627
Kelly ..	1,324	336	599
Average ..	1,410	373	657

Mareeba.—The summaries presented in Tables 1 and 2 give an indication of the results achieved, although it will be recalled that the crops were damaged by hail.

In a fertilizer trial there was an indication that a 2-17-4 mixture was better than 4-13-6. The average yield of cured leaf was 1,372 lb. per acre, the value based on appraisal prices £392, and the value based on auction prices £662 per acre.

In an observational trial, tobacco following cotton, and tobacco following velvet beans gave average yields of 1,595 lb. and 2,004 lb. of leaf per acre respectively.

The values based on appraisal prices were £430 and £477 per acre, and the values based on auction prices £750 and £865 per acre. The heavy yield following velvet beans was probably due to increased soil nitrogen, but quality was appreciably lower than was the case where tobacco followed cotton.

Clare (*Lower Burdekin*).—The 1950-51 season was unsatisfactory because of excessive rains. The method-of-irrigation trial was seriously affected and only ungraded weights were obtained—765.8 lb. of leaf per acre from the spray-irrigated plots and 743.8 lb. per acre from the furrow-irrigated plots. Results from the rotation trial are shown in Table 3, where tobacco following maize and tobacco following peanuts occupy the first two places.

TABLE 3.

ROTATION CROPPING—TOBACCO AFTER OTHER CROPS.

Treatment.	Yield of Leaf.	Appraisal Value.	Auction Price.
	Lb. per acre.	£ per acre.	£ per acre.
Tobacco following maize..	1,154	340	533
Tobacco following peanuts	1,027	300	474
Tobacco following Gambia pea	1,001	290	459
Tobacco following weeds..	942	282	442
Tobacco following Rhodes grass	892	271	424
Average	1,003	297	466

In an exploratory fertilizer trial on Clare Sandy Loam, the main response of note was to the fertilizer mixture 2-17-4 at 640 lb. per acre and side-dressings of nitrate of soda, 50 lb. to 200 lb. per acre, when the plants were 12 in. tall. Yield differences between the various rates of application of nitrate of soda were not marked, but even the lowest rate of application greatly increased yields. Thus on virgin Clare Sandy Loam, side-dressing with 50 lb. to 100 lb. of nitrate of soda per acre is advisable, particularly where land preparation has been delayed and much unrotted organic matter is present in the field at transplanting.

In another trial, although no yield data were obtained, observations showed that growth on heavily-graded Burdekin Fine Sand was yellow, stunted and potentially low-yielding in comparison with normal vigorous growth on the ungraded or the filled sections.

1951-52 Trials.

Frequent irrigations were necessary to bring the crops through to maturity, but field experiments were completed as planned. However, all leaf has not yet been marketed and complete results in terms of monetary values based on leaf quality are not yet available.

Mareeba.—Two rotation trials (representing a continuation of the series established earlier), a varietal trial, and a seed-increase polt of the variety Mammoth Gold were successfully grown and harvested. Transplanting into the field was carried out in the period September 17-25. Leaf ripened rapidly during December.

In the rotation trials, tobacco following 18 months of Rhodes grass was outstanding, and although tobacco following velvet beans gave a heavy yield, the quality of the leaf was unsatisfactory. In the varietal trial, Bottom Special, Yellow Special and Virginia Gold showed much promise.

Clare (*Lower Burdekin*).—The rotation trial and the grading trial on Burdekin Fine Sand were continued. Also included in the programme were a varietal trial and a pilot plot on Tootra Sandy Loam. Night-watering trials on Clare Sandy Loam and Tootra Sandy Loam were attempted in co-operation with the Irrigation and Water Supply Commission.

In the rotation trial, the best-quality leaf was harvested from tobacco following Rhodes grass. The varieties Virginia Gold and Broadleaf yielded well in the varietal trial. In the land-grading trial, differences in tobacco growth between heavily-graded and filled portions of the land were still marked, even though the land had been under a cover crop for 12 months following grading. The differences, however, were appreciably less than when tobacco was grown on the land shortly after grading, as happened in the 1950-51 season.

GULF EXPLORATORY FARM.

Cropping investigations have been continued on the Exploratory Farm at Wrotham Park, where the growing of fodder crops to supplement pastures in the winter-spring period has been studied for three seasons.

The first useful rains (1.30 in.) of the season occurred on December 15. Further rains gave a total of 5.53 in. (8 wet days) for December, 5.97 in. (9 wet days) in January, 2.47 in. (7 wet days) in February, 2.29 in. (8 wet days) in March, and 1.30 in. (2 wet days) in April; May was rainless. The 1.15 in. registered on April 26 gave a very useful increase in soil moisture, in contrast with the March rainfall, which made no effective contribution. Although the seasonal rainfall was below normal it was sufficient to produce fair crops of both grain and fodder sorghums.

Cultivated Crops.—The land was ploughed and prepared for planting before December. The first series of crop plantings were made during the period December 21-30 and the second series from January 6-10. The third series, constituting the late plantings, could not be planted until April 28-May 2. Most plots were fertilized with superphosphate at 112 lb. per acre, except for short untreated sections at one end. About six acres in one portion of the cultivated area were also used for a superphosphate v. Nauru rock phosphate trial.

Satisfactory germinations were obtained from both the December and January plantings and all planted areas made good progress in January. Growing conditions in February and March were less favourable but fair progress was maintained. Good regrowth of the Sudan grass occurred in April, but growth declined with the dry weather in May.

Both the December- and January-planted fodder sorghums made good growth and produced satisfactory tonnages of green material. The January plantings, however, appeared to develop weaker stems than the earlier plantings and showed a tendency to lodge. Plots of both plantings were cut in March. Yield estimates based on sample cuts are shown in Table 4. There was no appreciable difference between fertilized and unfertilized areas.

TABLE 4.

YIELDS OF FODDER SORGHUM AT WROTHAM PARK.

Variety.	Sown.	Number of Borders Cut. (Each Border ·95 acre).	Average Yield of Green Material per acre.
			Tons.
Saccaline	22-30/12/51	4	11·16
Saccaline	6/ 1/52	1	12·34
Sudan Grass ..	21-30/12/51	6	7·58
Italian	22-30/12/51	4	10·02
Italian	6/ 1/52	1	7·58
Honey	21-30/12/51	4	13·01
Honey	6/ 1/52	2	11·08

All grain sorghums matured rapidly in March, but as with the fodder sorghums, lodging occurred in the January plantings, particularly after they had matured. In Martin, stem-breaking occurred just below the heads, causing most of them to fall to the ground. In Hegari, and to a lesser extent in Alpha, lodging occurred at the base of the stalks.

The grain sorghums were mature by mid-April, the average number of days to maturity from planting being 95 for Martin, 100 for Alpha and 113 for Hegari. Sampling for grain-yield estimates was carried out on April 27, and the data are shown in Table 5. There was no appreciable difference between fertilized and unfertilized areas. Under the seasonal conditions experienced, the grain sorghum yields can be considered very satisfactory.

TABLE 5.

YIELDS OF GRAIN SORGHUMS AT WROTHAM PARK.

Variety.	Sown.	Number of Borders Grown. (Each Border ·95 acre).	Average Grain Yield.
			Cwt. per acre.
Alpha	21-30/12/51	4	10·4
Hegari	21-30/12/51	5	9·6
Alpha	6/1/52	1	8·7
Martin	21-30/12/52	4	7·4

The late April to early May plantings germinated very poorly and fair stands were established only on a few acres. This failure was due largely to difficult seedbed preparation and necessary delays after rain before the land could be worked. Heavy weed growth which developed from December to February was turned under with a sundercut with some difficulty in March. This unrotted organic matter in the soil interferred with the spring-tooth combine used for planting and a disc drill would have been much more efficient. Germination was best where the soil was compressed around the seed, indicating that rolling after planting would have been useful.

Parrots were attracted by the sorghum grain in large numbers and wild pigs caused some damage before they were eradicated. A heavy infestation of Heliothis caterpillar injured the sorghum in January and February, while numbers of wireworms in the soil further depleted the thin stands of the April-May planting.

A trial to examine the relative merits of superphosphate and Nauru rock phosphate was set out, using Poona pea as the test plant. Growth was much better and lasted longer on the superphosphate-treated plots than on the Nauru phosphate plots.

The main conclusions from the year's work on cultivated crops are: (1) With a rainfall of about 16 inches reasonably well distributed over the summer months (December to March inclusive), grain and fodder sorghums gave fair yields. It is noteworthy that the total rainfall for the eight months before December was only 1.05 in., so the crops had to grow on soil moisture provided by the current seasonal rain. (2) From the point of view of standing-over fodder crops for grazing in the spring and early summer, planting late in April is desirable. However, the preparation of a good seedbed after the summer rains and the establishment of a good strike in late plantings present difficulty. Dry-planting may offer a solution. (3) The deterioration in quality and the heavy grain losses from parrot attack suggest that standing-over of fodder crops in the field may not be advisable. Harvesting at maturity and storage under suitable conditions would allow maximum use of sown crops as stock food, but this procedure may not be sound economically in the area represented by Wrotham Park.

Pastures.—Native pastures responded quickly to the summer rains, but deteriorated during March, particularly on the less-fertile soils of the ridges. Growth on the open plains was fair and showed a surprisingly rapid response to the late-April rain. The response was more marked on virgin grassland than on areas which had received some cultivation treatment.

It was again observed that one cultivation would eradicate the blue-grass *Dichanthium fecundum*, the dominant grass species on the open plains, in contrast with Flinders grasses (*Iseilema* spp.), which were improved by this treatment. Stands of the latter grasses, however, were eradicated by two cultivations and were seriously reduced by burning. The weeds Mexican poppy (*Argemone mexicana*) and wild jute (*Corchorus olitorius*) were prevalent in some Flinders grass stands.

Blue-grass areas which had been lightly disced in 1950 gave only 8 cwt. of air dry hay per acre when cut at the right stage in February, and Flinders grass, cut in April, gave about 1 ton of hay per acre. Last year the yields were nearly 2 tons of hay per acre for these grasses.

Of the introduced pasture species planted in plots, buffel grass and phasemy bean were most impressive. Para grass and elephant grass grew surprisingly well during the summer but faded with the onset of the dry cooler months.

FIELD CROP STATISTICS.

(Source : Queensland Government Statistician).

ARROWROOT.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Tons.	Tons.
Average 1935–36 to 1939–40	888	9,456	10·65
1946–47	551	5,009	9·09
1947–48	471	5,540	11·76
1948–49	587	7,068	12·23
1949–50	621	7,506	12·09
1950–51	699	7,849	11·23

BARLEY.

Year.	Area for Grain.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	9,738	153,153	15·7
1946–47	9,099	68,403	7·5
1947–48	17,210	433,368	25·2
1948–49	27,674	622,323	22·5
1949–50	25,074	578,193	23·1
1950–51	26,099	489,075	18·7

Broom Millet

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Cwt.	Cwt.
Average 1935–36 to 1939–40	532	1,560	2·93
1946–47	191	817	4·28
1947–48	172	664	3·86
1948–49	99	463	4·68
1949–50	191	1,040	5·45
1950–51	90	416	4·62

Canary Seed.

Year.	Area for Grain.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	19,233	91,616	4·8
1946–47	5,940	18,756	3·2
1947–48	6,815	61,273	9·0
1948–49	13,847	132,303	9·6
1949–50	13,016	126,762	9·7
1950–51	11,932	125,961	10·6

Cotton.

Year.	Area.	Yield.	Yield of Seed Cotton per Acre.
	Acres.	Lb.	Lb.
Average 1935–36 to 1939–40	55,504	18,599,000	335
1946–47	7,902	3,022,320	382
1947–48	8,460	2,064,000	244
1948–49	6,222	1,821,000	293
1949–50	2,688	718,513	267
1950–51	2,952	1,102,482	373

Grain Sorghum.

Year.	Area for Grain.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	*a*	*a*	*a*
1946–47	68,775	1,295,442	18·8
1947–48	116,079	3,335,322	28·7
1948–49	48,011	899,136	18·7
1949–50	99,362	2,157,717	21·7
1950–51	166,311	3,683,286	22·1

a Very small amounts. Exact figures not available.

Lucerne Hay.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Tons.	Tons.
Average 1935–36 to 1939–40	50,600	84,808	1·7
1946–47	44,510	89,589	2·0
1947–48	46,798	103,356	2·2
1948–49	40,331	92,818	2·3
1949–50	41,455	98,484	2·4
1950–51	33,947	87,177	2·6

Maize.

Year.	Area for Grain.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	174,628	3,272,000	18·7
1946–47	141,487	2,942,934	20·8
1947–48	127,703	3,487,000	27·3
1948–49	97,598	2,451,000	25·1
1949–50	115,550	3,392,817	29·4
1950–51	112,467	3,028,899	26·9

Millet Grains.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	*a*	*a*	*a*
1946–47	39,372	406,756	10·3
1947–48	16,086	236,430	14·7
1948–49	14,103	250,614	17·8
1949–50	14,832	265,734	17·9
1950–51	20,225	314,382	15·5

a Very small amounts. Exact figures not available.

Navy Beans.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	..	...	..
1946–47	1,253	8,414	6·72
1947–48	1,119	12,253	10·95
1948–49	1,808	12,562	6·95
1949–50	2,147	28,130	13·10
1950–51	2,239	12,578	5·62

Oats.

Year.	Area for Grain.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	8,542	102,819	12·0
1946–47	15,433	78,606	5·1
1947–48	24,974	473,865	19·0
1948–49	21,278	418,725	19·7
1949–50	20,456	337,566	16·5
1950–51	16,998	221,202	13·0

Peanuts.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Lb.	Lb.
Average 1935–36 to 1939–40	14,542	13,641,000	938
1946–47	38,800	50,960,000	1,313
1947–48	34,645	35,402,939	1,022
1948–49	24,290	22,238,369	916
1949–50	17,697	17,710,141	1,001
1950–51	16,656	11,896,145	714

Potatoes.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Tons.	Tons.
Average 1935–36 to 1939–40	12,144	20,929	1·7
1946–47	10,536	22,599	2·1
1947–48	10,664	29,299	2·7
1948–49	11,184	27,511	2·5
1949–50	11,624	30,681	2·6
1950–51	10,783	24,725	2·3

Pumpkins.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Tons.	Tons.
Average 1935–36 to 1939–40	21,829	52,248	2·4
1946–47	34,106	70,734	2·1
1947–48	29,970	75,038	2·5
1948–49	28,236	68,801	2·4
1949–50	28,349	72,221	2·5
1950–51	26,292	58,260	2·2

SUGAR.

Year.	Area Harvested.	Yield of Cane.	Yield per Acre.	Sugar Manufactured.
	Acres.	Tons.	Tons.	Tons.
Average 1935–36 to 1939–40 ..	246,718	5,181,000	21·0	758,000
1946–47 ..	219,394	3,717,330	16·9	512,000
1947–48 ..	215,378	4,152,456	19·3	572,000
1948–49 ..	257,944	6,433,556	24·9	910,000
1949–50 ..	272,812	6,518,042	23·9	896,000
1950–51 ..	263,666	6,691,706	25·4	880,000

WHEAT.

Year.	Area for Grain.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	340,055	4,767,000	14·0
1946–47	247,996	704,835	2·8
1947–48	462,239	10,685,000	23·1
1948–49	607,750	14,317,000	23·6
1949–50	600,013	11,778,495	19·6
1950–51	558,780	8,785,254	15·7

TOBACCO.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Lb.	Lb.
Average 1935–36 to 1939–40	3,659	2,033,736	556
1946–47	2,255	1,968,848	873
1947–48	1,912	1,581,440	827
1948–49	1,678	1,625,792	969
1949–50	2,677	2,539,592	949
1950–51	4,142	2,144,278	518

WHEATEN HAY.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Tons.	Tons.
Average 1935–36 to 1939–40	5,388	5,379	1·0
1946–47	9,573	3,346	0·3
1947–48	7,388	8,956	1·2
1948–49	8,261	9,669	1·2
1949–50	3,835	4,844	1·3
1950–51	3,755	4,638	1·2

REGIONAL EXPERIMENT STATIONS.

Mr. W. G. Wells, Director, Regional Experiment Stations.

Although irregular climatic conditions were experienced at all of the Regional Experiment Stations it was possible to implement most of the programme of investigations planned for each. The more important findings are either presented in the following summaries or are included in the reports of the Branches conducting the investigations. The monthly precipitations are presented in Table 1 to indicate the rainfall experienced for the 12 months at each centre.

TABLE 1.

RAINFALL, 1951-52 SEASON (IN INCHES).

Month.	Hermitage.	Biloela.	Ayr.	Kairi.
July ..	·11	·28	·34	·64
August ..	·82	·83	..	·22
September..	·58	·41	·28	3·03
October ..	1·28	1·74	..	1·56
November	·37	·01	·47	·10
December ..	2·48	2·32	·11	4·10
January ..	·38	2·85	11·73	8·27
February ..	3·52	2·31	5·04	6·05
March ..	4·04	4·71	1·20	3·17
April ..	1·86	2·54	3·22	2·32
May ..	3·78	4·24	1·29	2·26
June ..	2·41	1·51	1·34	·93
Total ..	21·63	23·75	25·02	32·65

HERMITAGE.

The value of practising on the heavy soils of the Darling Downs crop rotations that include fallows of sufficient duration to absorb ample subsoil moisture prior to planting was well demonstrated in the winter cereals experiments. As a result of heavy rains in January, 1951, wetting the subsoils to good depths, the following rains to July, totalling 6.51 in., although 3.16 in. below the district average for the comparable periods, were sufficient to enable plantings being completed by the end of June and good stands to be obtained. Satisfactory development of these stands was maintained under conditions of only 3.16 in of scattered rains experienced during the growth of the crops, which yielded in the case of wheat up to 51 bush. per acre, the grain being of excellent quality. A feature of the growing period of the cereals was the two series of exceptionally low temperatures experienced in late July and again in the third week of August, when grass readings were approximately 13°F. on four mornings at Warwick, the nearest official recording centre.

The exceptionally dry weather ruling from June, 1951, until February, 1952, seriously disrupted the implementation of the programme of investigations relating to summer crops. The following summaries present the more important results obtained in the experiments conducted by the station staffs. Facilities were provided for the Agriculture Branch to carry out a comprehensive plant-breeding and testing programme in wheat, oats and linseed crops.

Crops.

Oats.—The ability of the Vicland (Victoria x Richland), Fultex (Fulghum x Victoria), and Klein varieties of oats to produce satisfactorily under the combination of a good supply of subsoil moisture and a dry growing period was demonstrated by the results obtained in their pure-seed multiplication areas, yields averaging 34 bush. of grain per acre.

Wheat.—In contrast with the very wet planting period of the 1950-51 season, which necessitated replanting most of the wheat experiments, all plantings were established under satisfactory conditions. The two series of low temperatures, however, killed considerable percentages of plants in all varieties planted in May except Lawrence, which appears to have outstanding cold resistance. Less advanced plantings made later in June were only temporarily checked by the frosts. Under the dry conditions prevailing during most of the growing period very little rust developed. Although only 3.16 in. of scattered rainfall occurred during the growth of the varietal trial, compared with 12.87 in. during the growth of the varietal trial of 1949-50, the yields of seven varieties included in both experiments were higher in 1951-52 except for the two longest-season types—Kendee and Charter. These results emphasise that, in a season of low rainfall, adequate subsoil moisture at planting time may result in the production of better yields than those obtained in a much wetter growing period. This applies particularly to the quicker-maturing varieties.

In a repetition of the complex fertilizer trial of the previous season, which embraced the application of combinations of superphosphate and sulphate of ammonia at planting of the Puora variety on both fallow and following a cowpea green-manured crop, no significant differences were obtained, although there was an overall tendency for an application of 190 lb. superphosphate to increase yields. Judged by the Pelshenke dough test, the quality of the grain was very significantly improved by this application of superphosphate; the overall quality of the grain produced on the fallows was superior to the grain grown after the cowpea green-manure crop. In a trial of the relative merits of blood and sulphate of ammonia as suppliers of nitrogen, no significant differences were obtained. A substantial acreage of the most reliable areas for wheat was made available to the Agriculture Branch for varietal, strain and progeny tests and for pure-seed multiplication.

Grain Sorghum.—Owing to the lack of planting rains until it was too late to obtain a crop before frosts in a normal season, no plantings of this crop were made. The several tons of pure seed of the Alpha and Kalo varieties harvested in the previous season were readily sold for commercial-planting purposes.

Pastures.

Lucerne.—The good performance of drilled lucerne on both alluvial and shallow hillside soils in the previous year resulted in further plantings of this crop on hillside areas. These newer plantings and the old areas on the alluvials withstood the dry conditions reasonably well, but the older hillside plantings were severely affected. Old stands of row-cultivated lucerne in adjacent areas yielded surprisingly well. The satisfactory performances obtained in recent seasons with several strains of brome grass and phalaris as pure stands led to the planting in April, 1951, of each of the best performers in combination with lucerne. All combinations grew well during the first winter but by December all of the grasses except *Bromus inermis* (which still retained green shoots) had dried out. Regrowth occurred in these areas following the February rains and by April provided good grazing, with lucerne and phalaris appearing the most attractive combination. The prolific seeding of the brome grasses resulted, however, in an excessive stand of seedlings; this may necessitate careful grazing management in order to maintain a satisfactory balance between the lucerne and the grass. In combinations of lucerne and *Agropyron sibiricum* and of Auburn woolly pod vetch and *Bromus carinatus*, a much better balance of legume and grass was obtained in the regrowth in the autumn.

Nursery.—A further 25 introductions were established in the nursery, making some 100 odd species and strains of legumes and grasses under trial. The weather experienced from June to January provided a severe test of the ability of all winter-growing strains to make worthwhile production to midsummer. At the end of January, *Bromus inermis* retained more green leaves than any of the other strains of *Bromus* or *Agropyron* under trial. Of the summer-growing species, blue panic, with rather coarse-stemmed foliage 36-40 in. tall, provided more feed than any other grass in the nursery. By the end of February all summer species except scrobic were performing well, while in most winter species either a good stand of seedlings was developing or regrowth from old stools was occurring. Phalaris, however, responded very slowly, the roots appearing to be sodbound; there was good growth of younger stands and seedlings of this species.

BILOELA.

The dry conditions which commenced in mid-February of 1951 continued until mid-December. Planting of winter cereal experiments following rainfall was therefore impossible, and with the exception of cotton all of the

season's summer plantings were delayed until after mid-January unless they were to be grown with supplementary irrigation. The abnormal weather was very suitable, however, for carrying out a comprehensive programme of investigations relating to the irrigation of lucerne and cotton and for testing the merits of various cultural measures in increasing the yields of a range of crops and pastures under very dry conditions. The following summaries record the more important findings.

Crops.

Oats.—Although ample subsoil moisture was available in the fallows reserved for winter cereals, lack of planting rain prevented the conduct of investigations in oats.

Wheat.—Advantage was taken of the availability of irrigation facilities for planting the standard varietal trial to ensure a continuity of records of varietal performances. A 2-in. spray application on July 3 connected with the subsoil moisture, which was present to a depth of 48 in. A further 2-in. spray irrigation was applied as the wheat seedlings were emerging to ensure their uniform establishment. No further irrigation was applied until September 25, when a 2-in. spray application was given to half of the experiment to provide a test of the value of added moisture at this stage of the development of the crop. Moisture determinations when the earlier-maturing varieties were in full head indicated that under the dry conditions the plants which were not late-irrigated had utilised all available moisture in the top 36 in. of soil, or over 6 in. out of a total of 8 in. of water stored in the soil at time of planting.

Although gains ranging from 5.3 to 12.5 bush. per acre were realised with the 2-in. irrigation in late September, the greater gains obtained in the slower-maturing varieties indicated, as occurred at Hermitage in 1949-50, that such additional water was more beneficial when the majority of the heads were just emerging from the sheath rather than when the plants were in full head, as were the earlier maturing varieties. Data obtained from Puora, Gabo and Kendee indicated that the late irrigation increased both number of grains per head and grain weight. Judged by the Pelshenke test, however, there was a general tendency for the grain from the areas not irrigated in September to produce stronger dough. The results, as a whole, confirm the previous findings at this station that it is advisable to have the seedbed wet to a depth of more than 36 in. at planting of wheat in this district to ensure yields of 30 bush. per acre being obtained.

Grain Sorghum.—The importance of ample subsoil moisture at planting of grain sorghum was again demonstrated by the difference in growth obtained between 3½ ft. row-spaced crops of Alpha planted on the same day on soils wet to depths of 17 in. and 28 in. at planting which yielded respectively 16 and 30 bush. per acre. In a trial of 10 commercial varieties on soil wet to 17 in. at planting, Kalo led with a yield of 20 bush. per acre.

Investigation of the prussic acid content of grain sorghums was continued, weekly sampling of Kalo, Hegari, Alpha and Caprock being made through the main growing period. Readings in all four varieties at the first sampling exceeded 32 milligrams per 100 grams of green material, due possibly to the combination of dry conditions checking the plants sufficiently to cause wilting and then rains a few days ahead of the sampling date renewing good plant growth. Readings then declined rapidly to below the permissible level of 20 milligrams per 100 grams green material except in the slowest-flowering type, Hegari, which remained above this figure a fortnight longer than the other varieties. Examination of different parts of individual Caprock plants indicated, however, that although the contents of a whole plant sample might be satisfactory, the content of the leaves could be above the permissible level with the stem branches containing less than half as much as the leaves. The results support previous findings at this station that the prussic acid content of the grain sorghum plant declines progressively as the plant develops to the heading stage. The rate of decline may be greatly accelerated by a check caused by dry conditions, but if the following rainfall promotes rank growth of plant the overall content of most varieties, especially slow-maturing types, may be greatly in excess of the lethal level until the new growth approaches the heading stage.

Cotton.—Although planting rains for the rain-grown cotton crops were not experienced until mid-December, the subsequent rainfall was very favourable for such late-planted cotton and in conjunction with absence of frosts at normal dates many experiments give promise at June 30 of yielding better than could usually be expected from such late plantings. The very dry season provided favourable conditions for investigations relating to irrigated cotton, and although the final pickings are not completed, the following brief summaries of the irrigation experiments may be presented:—

(1) In an irrigated rotation experiment, cotton following Rhodes grass substantially outyielded cotton following either cotton or grain sorghum, producing 1,459 lb. seed cotton per acre on the first picking with prospects of a good second picking being obtained.

(2) A mean yield of 1,471 lb. seed cotton per acre was obtained in an irrigated varietal trial, with a heavy second picking in prospect and little difference between varietal superiority in evidence.

(3) In a time-of-irrigation investigation, five irrigations of 3 in. each, including a pre-planting watering, produced 1,647 lb. seed cotton per acre in the first picking with prospects of a good second picking. Under the dry conditions the heavily-laden crops required fortnightly waterings of 3 in. during late January and February.

(4) Results of mechanical harvesting of an irrigation varietal trial indicated that although up to 2,064 lb. seed cotton per acre was harvested with the machine at the first pickings of the highest-yielding variety, only 79.5% efficiency was obtained. Plant type was abnormal due to heavy terminal losses from early insect attacks causing the development of excessive vegetative growth and leafage.

(5) Promising results were obtained in tests of several defoliants under trial for the first time at this station.

Cowpeas.—The Cristaudo variety, which performed so well in the previous season under a combination of luxuriant growing conditions in the first half of the season and no rainfall in the later stages of the crop, has under very difficult conditions again shown promise of being an excellent variety for this district. Two other new introductions also performed very well.

Soybean.—In a trial of varieties supplied by the Agriculture Branch, several developed fair crops of seed, but under the dry conditions set many of the pods so close to the ground that they could not be harvested with an ordinary header. Cutting and then harvesting through the use of pick-up attachment on the header proved more satisfactory, although shattering of the pods reduced by 25% the yield of Tokio, the leading variety, which yielded 12.64 bush. of harvested beans per acre.

Pastures.

Lucerne.—Lucerne established in April, 1950, produced 6.19 tons of hay per acre under rain-grown conditions between July, 1950, and May, 1951. Under the very dry weather conditions from June to January, the second year's growth was mostly poor, although row-cultivated areas responded better than sward to the scattered storms. The nitrate content of the 0-6 in. level was appreciably greater in both row-cultivated and sward lucerne after the start of the rains in January than in row-cultivated scrobic. Irrigation of both row-cultivated and sward lucerne indicated the need, under the dry conditions, of accurate timing of applications of 3 in. spray irrigations. Irrigated lucerne grown in alternate rows (3½ ft. row spacings) with either scrobic or green panic yielded as well as or heavier than scrobic but was substantially outyielded by green panic, which tended to invade the lucerne after the commencement of the late rains. Investigations of methods of pump irrigation for obtaining the maximum possible yield of lucerne in such a dry season indicated non-economical water requirements.

Seed Harvesting.—The promising results obtained with green panic, both on the station and on farms in many districts of the State, has focussed attention at Biloela on efficient methods of producing and harvesting satisfactory seed of this species. Preliminary trials of methods of harvesting green panic seed on the station last season gave promising leads, but the results of germination tests soon after harvesting were unsatisfactory, the best test yielding only 9% viable seed.

Repetition of the tests at 3-monthly intervals indicated, however, that the seed matured with storage and in six months improved from 9% to 65% viable seed. Efforts were therefore concentrated during the past season on field-scale methods of machine-harvesting of green panic. Under the adverse seasonal conditions only a light crop of seed was set; this yielded 104 lb. seed per acre hand-harvested, compared with 79 lb. per acre each where the grass was either cut by binder, stooked and threshed or headed with a Case A6 "all crop" combine harvester. Repeated germination tests of the seed obtained by each method will be conducted preparatory to an expansion in operations next season.

Nursery.—Further plantings of pasture species in the introduction nursery brought the number under trial to 134. Some of the first introduced strains which had shown sufficient promise under a wide range of seasons were established in the special seed-multiplication area recently developed with irrigation facilities to expedite the production of seed-stocks for station and district grazing trials. Row-cultivated and sward trials of scrobic, green panic, blue panic, buffel and Rhodes grasses were continued, and during the period to January 30 gains from 400% to 500% dry hay were obtained in the row-cultivated areas of all species. Green panic and Rhodes grass performed appreciably better than the other species.

Field Day.

A field day held early in May was attended by some 130 visitors.

AYR.

The occurrence of subnormal rainfall throughout the 12 months, with the exception of January and February, placed emphasis on timely irrigation of all crops. As a result, a better understanding of the water requirements of the wide range of crops and pasture species under investigation at this station was obtained. The summaries of the more important results are presented herein or by the appropriate Branches responsible for the conduct of the investigations.

Crops.

Sunflower.—The yields obtained in a varietal trial of Advance, Polestar and Jupiter, while lower than that of the leading variety (Advance) in the 1950-51 trial, indicated again that sunflower can be grown satisfactorily as a winter crop in this district.

The performance of all varieties pointed clearly, however, to the need for very fertile soil and ample moisture at critical stages of growth. This hypothesis was supported by the results obtained in a row-and-plant spacing experiment of Advance on heavy, fertile soil, where the leading treatment appreciably exceeded the yield of this variety in the varietal trial.

Linseed.—Golden Viking, with a yield of 21 bush. per acre, significantly outyielded Morocco, Walsh, Rio and Malabrigo, which were of this descending order of merit.

Oats.—The promising results obtained with grazing trials of oats in 1950-51 led to the conduct of a varietal trial embracing the main standard commercial varieties and a range of newer rust-resistant types. Victand performed best and in 90 days from planting produced 5.5 tons of green hay followed by a regrowth of 1.14 tons in 30 days. The performances of the slower-growing and later-maturing Klein and Algerian were inferior to those of the quicker-maturing varieties.

Maize.—A varietal trial of Star Leaming, DS333 and Queensland hybrids Q440, Q739, Q790 and Q717 was planted in September to test the possibilities of obtaining satisfactory yields of grain during the period between the end of winter and the onset of the main wet season. Under the very dry conditions the water requirements were greater than estimated and the yields were only moderate, with the Queensland hybrid Q717 leading with 3,198 lb. grain per acre harvested by the end of January.

Sorghum.—The testing of grain sorghums of the tall-growing Kaffir type was continued in a trial of the most promising varieties in the observation plots of the previous season. Planted in April, all varieties failed to grow as rapidly or yield as much as when planted in the previous spring.

Cotton.—Further evidence was obtained that production of good yields of cotton in this district is correlated with February rather than either late March, early April or early spring plantings. The obtaining of a highly suitable variety for machine-harvesting is still a matter for investigation, however, although yields exceeding 2,000 lb. seed cotton per acre were realised with each of five varieties in the February plantings. In view of the very leafy type of growth developed by even high-yielding varieties, investigations of the possibilities of defoliating the plants sufficiently for efficient machine-harvesting were continued. Applications of calcium cyanamide dust at 40 lb. per acre in mid-January were easily made and achieved excellent defoliation of several varieties planted at the end of August. Sprays of both 1% and 2% pentachlorphenol were also efficient defoliants but required very even distribution at the recommended rate of 10 gal. per acre to obtain satisfactory leaf-fall. The evidence obtained suggested that applications of these sprays during cloudy weather or late in the afternoon were more efficient than applications during hot, sunny weather.

Castor Beans.—The evolving of a suitable method of growing castor beans for mechanical harvesting was furthered by the results obtained in row-and-plant-spacing trials of Q2804, a new introduction that gives promise of being suitable for Burdekin conditions.

Jute.—In co-operation with the Agriculture Branch and the Secondary Industries Division of the Department of Labour and Industry, considerable attention was given to testing the possibilities of successfully mechanising the production of jute fibre. Salient details of the operations are reported by the Agriculture Branch.

Pineapples.—Plant-crop yields have ranged up to 35 tons per acre according to the cultural systems applied. An additional commercial area was therefore planted in 1951-52 and experimental work is being intensified with particular reference to mechanised cropping and irrigation practices.

Pastures.

Under a rearrangement of responsibilities relating to the irrigated pasture investigations conducted in co-operation with C.S.I.R.O., the management of the growing and grazing of the pastures, involving some 25 acres of various combinations of tropical legumes and grasses, was assigned to this Department, while studies relating to the testing of new species, pasture combinations and the water requirements of the pastures now under trial were assigned to C.S.I.R.O. As a result of intensive methods of establishment, renovation and irrigation, the production of the pastures, even under the dry season, increased so greatly by the end of the summer that difficulty was experienced, in some combinations, in controlling growth satisfactorily by grazing with the number of bullocks available in the experiment. Grazed by young bullocks, the combination of Para grass and centro produced the most beef per acre and Rhodes grass and stylo the least. Rate of stocking, however, affected daily rate of liveweight gain per beast, which was in the following descending order:—Para grass and *Clitoria ternatea*, 1.52 lb.; Guinea grass and stylo, 1.46 lb.; Guinea grass and centro, 1.41 lb.; Para grass and centro, 1.28 lb.; and Rhodes grass and stylo, 1.15 lb. Rate of weight increase per beast was rapid and fairly consistent between September and December, but from January to March inclusive it was slower and accompanied by marked fluctuations which appeared to be related to the reaction of the beasts to the humidity. A view of portion of the plots is shown in Plate 3, page 17.

KAIRI.

The very dry weather experienced in the later part of the 1950-51 season continued until early in 1952 except for relief rains in October and December. More favourable conditions for growth of crops followed, but pastures at times suffered from lack of moisture. Further progress in the development of facilities for conducting investigations relating to both plant and animal industry was achieved. Summaries of the more important findings are included herein or in the reports of the Branches responsible for the conduct of the investigations.

Crops.

Maize.—Although the very dry autumn experienced last season materially reduced maize yields generally over the Tableland, the results obtained on the station indicated that even under such dry conditions maize yields

could be improved by at least 10 bush. of grain per acre by growing this crop in rotation with short-term pastures embracing lucerne for 18 months and then lucerne oversown with Rhodes grass for 2½ years' establishment. The application of a side-dressing of 2 cwt. of sulphate of ammonia also increased yields by 7 bush. per acre. The investigations were continued during the year but the crops had not been harvested by the end of June. The application of side-dressings of sulphate of ammonia under the better growing conditions of the past season did not increase the percentage of stalks with two ears, as was the case in the previous season, but the percentage of barren stalks was materially reduced in both maize following pasture and maize following two crops of maize, the control plots in the latter planting averaging 5% barren stalks. Evidence of nitrogen deficiency was also obtained in the planting of maize for silage, where the plants in closely-spaced rows were much smaller and lacked the dark-green colour of the plants in 3½ ft.-spaced rows following the lucerne—grass pasture.

Oats.—All oat plantings in the autumn of 1951 failed to grow satisfactorily during the following dry winter. In an effort to provide better moisture during the early growth of the plants, the oat plantings of 1952 were made during early April, as in the past the incidence of rust in Victand, Fultex and Klein has been negligible at Kairi. Prolonged showery weather following planting promoted growth of a much thicker stand of various broadleaved weeds than previously experienced on the station, and in addition Klein exhibited some degree of leaf rust which was not evident in the other two varieties. It is apparent, therefore, that if early-April planting of oats is to be practised, satisfactory control of weeds must be obtained and rust-resistant varieties should be used.

Cowpeas.—The Cristaudo cowpea has again performed well for green-manuring purposes, but when planted in combination with maize for grazing by pigs proved to be definitely non-attractive to the animals in the field and also to penned pigs. Accordingly, a cowpea strain trial embracing Cristaudo will be conducted for grazing by pigs during the coming season in order to discover a suitable strain for incorporating with maize for field grazing.

Fodder.—The testing of sugar-cane seedlings obtained from Meringa Sugar Experiment Station in order to discover a suitable type for propagating as a fodder cane was continued. The seedling J.337 selected from the trial of the previous season ratooned outstandingly better during the dry winter and spring than all other strains, and if it passes the test for disease-resistance now being conducted by the Bureau of Sugar Experiment Stations will be released to the Agriculture Branch for district testing.

The outstanding growth obtained with elephant grass in a trial planting has focussed attention to the possibilities of this grass as a standing fodder reserve for hillside farms, and the most promising strain of this species in the Biloela Nursery was established this season at Kairi for propagation and testing.

Miscellaneous Crops.—Land and facilities were again made available to the Horticulture Branch for establishing a trial plot of coffee, and to the Agriculture Branch for continuing a maize-green manure trial, an investigation of tea-growing and investigations relating to soil conservation.

Weed Control.—The range of weed species on the Tableland and their extraordinary population and rate of growth present many serious problems relating to weed control. In the maize-pasture rotation, encouraging progress is being achieved in reducing weed population to such numbers that inter-row cultivation of the maize and regular mowing of the pastures effect fairly satisfactory control. Without this rotation, however, all methods of cultural control have failed. Preliminary trials of weedicides in previous seasons having shown some promise of controlling weed growth with M.C.P.A., facilities for large-scale field trials were provided in the past seasons. The results obtained from spraying oats and various grass pastures indicate that some species of weeds can be killed at any stage with light concentrations of M.C.P.A., others are susceptible when young but when well developed are fairly resistant to even strong concentrations of this weedicide, while others react most irregularly. A comprehensive testing of a range of weedicides applied both as pre-emergence and as contact sprays will therefore be conducted next season.

Pastures.

Legumes.—Lucerne withstood the dry conditions surprisingly well both on shallow hillsides and on deep alluvial benches. It provided good grazing in pastures through most of the year and produced over 3 tons per acre of baled hay of good quality in the areas reserved for haying operations.

The greater utilisation of water by the deeper-rooted lucerne plant resulted during the long dry period in practically the complete killing of all Rhodes grass plants in the mixed pastures of these species. A thick stand of weeds developed during wet weather following the dry period and required regular mowing in order to maintain good pasture for the rest of the season. The resultant pastures, consisting mainly of lucerne, had to be grazed with extreme care on account of the danger of bloating the cattle, which had to be held in grass pastures at night. The performance of the tropical legume *Glycine javanica* in an old-established plot and in a new planting was most promising, and, depending on seed supplies, efforts will be made in the coming season to establish this legume in combination with several single-species grass pasture preparatory to conducting grazing trials.

Grasses.—Single-species pastures of common Guinea, green panic, blue panic, Para grass and Rhodes grass all performed well. Scrobic in both its second and fifth years of establishment failed to grow sufficiently to combat a heavy growth of weeds. In marked contrast, both green panic and Rhodes grass in adjacent areas maintained complete restriction of all weed growth. The carrying capacity of common Guinea indicated, however, that this species may prove to be an important component of pastures established on cultivations on the Tableland, particularly if a legume can be combined with it. There was evidence that neither the milking herd nor the pigs performed well on either Rhodes grass or kikuyu after the early-growth stage of the grasses. Each season supplies additional support of the hypothesis that paddocks of single-species pastures of several grasses may be required to meet fully the requirements of this district.

Animal Investigations.

Facilities were again provided for the continuation of the programme of investigations being conducted by the Division of Animal Industry and dealing with dairy cows, pigs and poultry. The more technical findings appear in the reports of the appropriate branches. Altogether 72 head of cattle, 153 pigs and 730 fowls inclusive of chickens were fed on the station during the year.

Field Day.

A field day held in mid-May, although threatened with wet weather, was attended by 100 visitors.

HORTICULTURE BRANCH.

Dr. S. A. Trout, Director of Horticulture.

The past year was one of the worst in the history of horticulture in Queensland. Apart from isolated storms, little or no rain fell between February 1951 and April 1952 in the main producing areas. Supplies of locally-grown crops were therefore light. The shortage was aggravated by severe frosts in July 1951, which destroyed large areas of pineapples, bananas and other plantation fruits. Reasonably good rain fell late in April and in May 1952, but it will be some time before fruit production is back to normal. Vegetable-growing areas will, however, resume production very quickly.

Labour has been offering rather more freely than in the past but skilled men are still scarce. Many farms do not carry an adequate labour force and production methods are therefore sometimes inefficient, even on farms managed by experienced growers and reasonably well equipped with machinery. There is consequently an unhealthy trend to extensive rather than intensive farming, which accentuates the speculative element in land use.

Recent developments in processing facilities are speeding-up the production of plantation crops in Central and North Queensland, where growers have only limited access to fresh-fruit markets in the capital cities. The emphasis is primarily on pineapples, but the area under bananas, papaws and mangoes should expand when processing techniques are developed and farmers become more experienced in handling these crops.

PINEAPPLES.

There was a marked decrease in pineapple production during the year owing to disastrous frosts in southern Queensland. Yields from a bearing acreage of 7,000 are unlikely to exceed 1,300,000 1½-bush. cases. Both the fresh fruit market and the canneries were undersupplied and normal deliveries cannot be expected before the second half of 1953. Ratoon crops suffered more than plant crops; as these supply the bulk of the planting material required for establishing new areas, the amount available is below requirements and current prices are therefore high.

The research programme carried out during the year followed much the same lines as that of the previous 12 months.

Weedicides.—Sodium pentachlorphenate (PCP) is now widely used as a pre-germination spray for weed control, and the results obtained in field practice are in line with experimental findings. Sprays of this type are not the complete answer to the weed problem, for during the summer months the cultural treatments, which must necessarily precede spraying, are hampered by wet weather. An emulsified oil containing a high percentage of aromatics can, however, be included in PCP solutions to deal with broad-leaved weeds. The best of these combination sprays contains 5 lb. PCP, 2 gal. oil and 100 gal. water Unfortunately, these sprays are less effective against grasses, but they kill back the above-ground portions of most species and eradication with implements is then simplified.

Flower Induction.—Some years ago, flower induction for a summer crop was introduced at Maroochy Experiment Station in order to systematise mass selection work. Alpha-naphthalene-acetic acid (ANA) is applied in May to produce a uniform summer crop. Results have been sufficiently good to focus attention on its value in commercial practice. Treatment tends to stabilise the fruiting habits of the area for the complete crop cycle. It is essential, however, that the plants should be large enough at the time of treatment to bear fruit of commercial size. The use of hormones to increase fruit weight still has only an experimental interest; costs of treatment are very nearly equal to the value of the increased yields obtained.

Plant Selection.—Mass selection is primarily a means of improving pineapple planting material and offsetting any deterioration which might otherwise take place on the farm. Advisory and demonstration work in this field has continued, but some attention is now being given to clonal selection, a method of isolating superior plants with great precision. Some clonal material was propagated during the year at Maroochy Experiment Station, and a few outstanding plant types have been reserved for field plantings in the future.

Wastage.—In the 1950 winter crop, significant reduction in wastage from black heart was obtained by spraying the plants in the spring with a 1% solution of borax. The 1951 winter was particularly severe and no similar reduction in wastage was obtained by boron sprays. Investigations in conjunction with the Meteorological Bureau and C.S.I.R.O. Section of Meteorological Physics are being conducted at the C.O.D. farm at Beerwah to determine the efficiency of a wind machine as a means of frost-prevention in pineapple plantations. A continuous record of temperature is also being obtained in eight representative plantations in the Near North Coast area and observations will be made on the effect of temperature on the condition of the plant and fruit. Very severe losses from cold injury occurred in pineapple plantations in 1951.

Packing.—Expansion of the pineapple industry in Queensland is hampered to a large extent by an acute shortage of good planting material. Approximately 18,000,000 additional plantings are made annually. The tops, which are used as planting material, are removed from pineapples consigned to the factory, but pineapples for the fresh-fruit market are packed with the tops attached. Thus approximately 10,000,000 tops of high quality become unavailable to commercial growers each year.

Experiments have shown that the top can be removed in such a way that it is still suitable for planting, and the cut portion of the fruit effectively treated to prevent weight loss and mould development. Experimental lots of pineapples packed without tops will be forwarded interstate to determine whether such fruit will carry over long distances.

Processing.—The drained weight of canned pineapples is specified by regulation and is related to the fill-in weight of the fruit and the concentration and quantity of syrup. Overseas buyers have requested similar specifications for frozen fruits, and investigations were carried out to determine the drained weight of frozen pineapple pieces packed in a syrup of 43° Brix. A decrease in weight of frozen fruit occurred during and after thawing, caused by water which separates as ice during freezing not being re-absorbed during thawing and by leakage of fluids through tissues injured by freezing.

Drained-weight loss was related to freezing conditions prior to storage, being greatest in fruit frozen at 11°F. and least in fruit frozen at −20°F. A delay of two hours between packing of the container and freezing increased the loss in weight. The results emphasise the importance of rapid and prompt freezing at very low temperatures, particularly if subsequent storage temperatures approximate 11°F., the temperature on overseas ships carrying frozen products.

Cannery Waste.—The disposal of pineapple skins and inedible trimmings is a problem in cannery operations and the waste is either dumped or dried for stock-food. This waste contains citric acid, sugar and fibre, all of which can be put to commercial use. Experiments during the past 18 months have shown that, from the juice extracted from the waste by heavy pressing, complete removal of protein can be achieved by maintaining the temperature of the juice at 70°C. for 30 minutes. Liming at pH 6.5 recovers citric acid as calcium citrate, while colour is removed by heating the syrup to 180°F. and passing it over a column of bone char. Pineapples canned in the recovered syrup, ranging in sugar content from 10.3 to 13.3 and made up to normal cannery syrup by added sugar, were rated equal in quality to the normal cannery pack. Recovery costs appear to be economic, but this can only be determined under commercial cannery operations. The final fibrous residue can be used as a stock-food with the addition of protein, or made into a building-board.

BANANAS.

Although there has been considerable interest in the banana crop for the past three years, the industry showed a further decline in 1951-52. In the spring of 1950, the number of planting permits issued pointed to an increase in the acreage under crop, but this prospect was negatived by heavy rains which hampered the clearing of land. Last year, land was cleared for planting, but lack of soil moisture either prevented planting or caused a considerable plant mortality in the field. Severe frosts in the winter of 1951 affected many plantations and these will not come back into full production until the spring of 1952. The current acreage is 11,431, compared with 12,362 in the previous 12 months.

The Banana Industry Protection Board met four times during the year, and has kept a close watch on bunchy-top trends. Major outbreaks occurred near Nambour and also on the South Coast. All have been effectively suppressed with the co-operation of the growers concerned. The Board's policy is, if practicable, to push back the disease from is present northern limit in the Cooroy district, and the inspectional staff is, therefore, being strengthened at Nambour. Some districts north of Brisbane are virtually free from the disease. If it is practicable to clean up the present infested area near Nambour, bunchy top would then be confined to the South Coast.

Eradication of old bananas is still a sizeable job, but the use of 2,4-D and its homologues is now general. The initial injection treatment involves no major trouble, but growers are apt to skimp the spraying of regrowth. Close inspection of eradication work is therefore necessary, as regrowth from bunchy-top-infected plants is a potent source of the spread of the disease.

Crop Management.—Methods of crop management have been further studied at Maroochy Experiment Station and plant-to-plant histories are now available from a 2-acre area of bananas. Some results are now being demonstrated in field trials. These are:—

(1) The necessity of using planting material which contains adequate food reserve for the needs of the young plant.

(2) The importance of applying fertilizer in adequate quantities within three months of planting and thereafter to the young offshoots.

Ripening.—Records of fruit temperatures in banana plantations in the Near North Coast and South Coast districts after the fruit had been harvested, and during transit to Brisbane by road and rail, were obtained during the summer months. Should the cases be exposed to the sun for a few hours after packing, the pulp temperature can exceed 100°F. During transit, air circulates through the stack and the pulp temperature is equivalent to the atmospheric wet-bulb reading. The importance of prompt ripening after harvesting is emphasised by the fact that 6 hours at 90°F., 9 hours at 85°F. and 12 hours at 80°F. reduced the life of the ripened fruit by 20% and considerably retarded the development of yellow colour. The condition known as boiling developed after 21 hours at 90°F., 33 hours at 85°F. and 45 hours at 80°F.

Losses in weight during the ripening of bananas have been determined under commercial ripening conditions. In summer-grown fruit, losses up to 5% can occur. As bananas are sold by weight, this represents a considerable monetary loss; further investigations will determine whether losses can be appreciably reduced without affecting ripening. Consideration is also being given to ripening bananas with esters of 2,4-D, which have given good results experimentally in America and which have the advantage of being non-explosive.

CITRUS.

The major portion of the citrus crop in Queensland comes from non-irrigated orchards near the coast. Production in these areas largely depends on the distribution of spring rains, for if these are light, the fruit set is invariably poor. In the spring of 1951, southern Queensland was in the throes of drought and only irrigated districts produced normal crops. The area under crop is approximately 6,200 acres, and production for the 1951-52 season from about 4,350 bearing acres is estimated at 300,000 bushels.

Many orchards in the more important citrus areas are now past their prime and trees show various symptoms of declining vigour. It is unusual for trees to remain in profit after they are 25 years old, and in some varieties decline sets in much earlier. Virus diseases are the principal cause.

There has been a marked interest in stock types for the more important commercial citrus varieties. Assessing the merits of any stock is a long-term experimental project, and in practice tree decline often forces growers to use untried stocks for at least part of their plantings. Some very useful information can therefore be got from orchard observations. Sweet orange is probably the best utility stock at present but trifoliata stocks are attracting attention in areas where root rots are troublesome. Nurserymen do not like them, however, as they occupy ground in the nursery for a longer period than citronelle or sweet orange.

Supplies of budwood and seed for nurseries have been maintained by the Branch, but the demand is much below that of the immediate post-war years. During the year, 151 lb. of seed and 64,000 buds were distributed. Budwood of the Emperor mandarin and Marsh grapefruit was difficult to get. In the former case, suitable wood is often not available when the nurserymen want it. In Marsh grapefruit, trees show symptoms of stem pitting, a virus disease which is transmitted through the buds, and budwood is therefore imported from New South Wales.

The budwood plot at Maroochy Experiment Station is laid out to permit observations on the performance of the several "A"-grade varieties grown on three root-stocks—rough lemon, sweet orange and trifoliata. Differences in tree growth are already apparent, but the real picture cannot be assessed until trees come into full bearing. It is, however, quite clear even now that trifoliata stock is unsuitable for lemons. Trees on this stock are particularly subject to scaly butt and it is doubtful if some will ever reach maturity.

One of Queensland's best mandarins, Beauty of Glen Retreat, tends to set too heavy a crop and thinning by hand is usually necessary in the orchard. Blossom-thinning sprays, such as DNOC, have therefore been investigated as a possible means of controlling the number of fruit per tree. The results have been rather inconsistent, partly through variability of the experimental trees and partly through an irregular response of the trees in successive years. It seems unlikely that such sprays can be used safely, but the associated physiological problems are of considerable interest and further observations will be made as opportunity offers.

In some citrus districts wide-delivery overhead-spray systems supplied from underground mains have been installed recently. The operational costs and labour requirements are much less than those of other systems now in common use. Where irrigation is needed at weekly or fortnightly intervals in early summer, as in some sub-coastal districts, the work is often carried out at the expense of other essential orchard operations. Wide-delivery overhead systems should, therefore, increase in popularity.

Maturity Standards.—Regulations prescribe that the acidity of citrus fruits offered for sale should not exceed a certain level and the fruit should be of normal flavour. Acting on Departmental advice, the majority of growers do not market their fruit until it is palatable as judged by taste, and only a very small quantity of citrus fruits is withheld from sale by inspectors because of immaturity.

In order to determine what factors influence palatability, determinations of acid, sugar content, skin colour and flesh colour have been made on Washington Navel, Joppa and Valencia oranges and Emperor, Glen Retreat and Ellendale mandarins picked from a number of selected trees in orchards situated in the Gayndah, Howard and Nambour districts. The acidity level at which fruit first becomes palatable ranged from 8 to 39 and the corresponding sugar content ranged from 7 to 13; thus prescribing a chemical standard as an index of maturity is difficult. A marked development of orange flavour frequently occurs on the tree over a relatively short period. Although there is no accompanying change in acid or sugar content, fruit becomes very much sweeter to the taste. It is fairly evident, from work over a wide range of climatic conditions during a period

of five years, that the time at which the fruit first becomes palatable is fairly constant from year to year. In the Gayndah and Howard districts this date is as follows:—

Washington Navel	—	Mid- to end-March.
Joppa	—	Mid-April.
Mandarins:—		
Emperor	—	Mid-April.
Glen Retreat	—	End-April.
Ellendale	—	End-May.
Late Valencia	—	End-June.

Similar varieties in the Near North Coast district mature approximately 2-3 weeks later.

DECIDUOUS FRUITS.

Growers of deciduous fruit have had a very mixed season. Soil moisture in winter and spring was sufficient to ensure a reasonably good set in both stone and pome fruits. Hail-storms in the northern part of the district caused a great deal of damage to apple orchards in November and December, some crops being virtually wiped out while in others much of the fruit was badly blemished. Excellent crops of stone fruits were harvested. The pome fruits, which ripen later, were, however, often short of water and the fruit lacked size. Stress conditions were most apparent in the variety Delicious.

Plantings during the past year were on a smaller scale than in the previous three years. About 60,000 apple trees were established, of which 6,000 Merton stocks were supplied from the Deciduous Sectional Group Committee's nursery. The major increase in acreage during the past decade has been in apples and since 1945 the area in production has increased by 1,500 acres. The total area of deciduous fruits under crop in 1951-52 was approximately 13,500 acres and production for the Granite Belt was as follows:—pome fruits 500,000, stone fruits 104,700 and grapes 83,650 bushel cases.

Although the soil of the Granite Belt is inherently poor, orchard trials have failed to show tree responses to fertilizer; particular emphasis has therefore been placed on cultural practices such as green-manuring. Fertilizer usage is scheduled for re-examination in the near future and some materials such as urea will be examined. Urea is a nitrogenous fertilizer which can be applied as a foliage spray, the nitrogen being taken in through the leaves and not through the roots.

Trace-element deficiencies are common in apples and some other deciduous fruits, and corrective measures for zinc, copper and boron shortages are now in general use. Disorders which may be due to lack of iron and possibly magnesium have, however, been noted during recent years, particularly in the apple variety Delicious. The iron deficiency may be lime-induced. Symptoms suggestive of zinc deficiency have also been seen in grapes and possible remedial measures are under trial.

Cool-Storage of Apples.—Although a lighter apple crop was harvested, cool-storage space in Brisbane and the Granite Belt is filled to capacity. Approximately 260,000 cases of apples, mainly of the Granny Smith variety, are being stored, and methods of maintaining the apples in good condition for long periods are therefore of considerable importance to the industry. The stage of maturity at the time of picking, storage temperature, and composition of the storage atmosphere are important factors in fruit storage. The volatile compounds liberated by apples during storage contain substances which can accelerate ripening, and it has been claimed that their removal by circulating the storage atmosphere through activated charcoal can prolong the storage life of apples.

In the 1951 season, Granny Smith apples picked at three stages of maturity were kept for various periods in stores equipped with continuous and intermittent air-circulation systems and in stores with the normal refrigeration equipment. The average wastage in the four stores was significantly less in fruit picked in mid-April than in fruit picked one week earlier or later, due to the greater incidence of superficial scald and breakdown in the first picking and greater mould wastage in the third picking. In both stores equipped with air-circulation systems, the apparent removal of volatiles increased the susceptibility of the first picking to superficial scald, but did not affect the keeping quality or colour of later pickings. The removal of volatiles by continuous air circulation maintained the fruit in a firmer condition. The work is being continued this year, using activated charcoal in gas-tight cabinets where artificial storage atmospheres containing low concentrations of oxygen and carbon dioxide are being maintained. This method, known as gas storage, is used extensively in England for apples and can prolong the life of certain varieties by as much as 50%. It is being used commercially in Australia for pears but has not been satisfactory for Granny Smith apples grown in southern Australian States, because the increased concentration of volatiles or carbon dioxide in gas-tight chambers has increased wastage from superficial scald.

Ripening of Pears.—At the beginning of the season, Williams pears, which ripen normally in the Stanthorpe district, will not ripen in Brisbane because of higher atmospheric temperatures. Experiments have shown that ripening at higher temperatures can be initiated by storing the fruit for 7 days at 40°F. or ripening it for 4 days at 65°F. with ethylene as the ripening accelerator.

Grape Experiment Plots.—The grape experiment plot at Severnlea continues to make good progress. Some of the vines planted on the lower portion of the slope have been discarded owing to the heavy nature of the subsoil and its unsuitability for the crop. Most of the vines are now coming into bearing and it will soon be practicable to determine the effect of resistant stocks on the fruiting habits of the more important commercial varieties—Muscatel, Purple Cornichon and Waltham Cross.

PAPAWS.

Papaw plantings in 1951 were heavy but most of them suffered from stress conditions in the field. Substantial losses also occurred from frost in winter and from dieback in summer. The market for both processed and fresh fruit is, however, very buoyant and plantings in the autumn of 1952 were again heavy. The acreage under crop at present is 1,100 and estimated production for the year is 280,000 bushel cases.

Field Investigations.—The main horticultural interest in the papaw continues to be the improvement of varieties. Regional trials have demonstrated that it may not be possible to breed a variety which is suitable for all parts of the State. For this reason, one of the pure varieties (Improved Petersen) released two years ago is now recommended only for the Near North Coast. The other, Bettina, has a greater field of usefulness, but its performance in districts other than the Near North Coast is not so satisfactory as in the Nambour area, where it was bred.

Pure lines of this type are developed by inbreeding and may lack some of the vigour and adaptability of mixed material. Hybrid types produced from pure lines of Improved Petersen and Bettina have proved superior in both yield and fruit quality to either parent and all of the commercial strains so far tested. Regional trials of these hybrids will shortly be established throughout the State.

At Redlands Experiment Station, mulching material was used in part of an experimental area of papaws. Plants in the mulched area were much more vigorous than those in the untreated plots, but the peak period of fruiting was substantially delayed in the mulched area. This could be important in commercial practice, as much of the fruit borne in late winter and early spring lacks flavour and is very subject to ripe-fruit rots. Cultural methods which affect time of fruit maturity may therefore be of considerable importance.

Artificial Ripening.—Papaws are ripened commercially in the winter months in rooms heated with kerosene burners or electric elements. Artificial ripening softens and colours the fruit before surface moulds can develop. In order to determine the optimum ripening conditions for papaws, samples of 12 strains grown at Redlands Experiment Station were picked at various colour stages over the period July to November inclusive and ripened at a range of temperatures. Fruit ripened most satisfactorily after 2 days at 85°F., using a concentration of 1 part of coal gas to 1,000 parts of air, 5 times per day. Fruit had to be at the quarter-to half-colour stage to develop satisfactory colour on ripening. Some fruits failed to ripen normally and remained hard and unpalatable even after prolonged periods in ripening rooms. This phenomenon is also experienced by commercial growers. Although artificially-ripened fruits were of attractive appearance and colour, the natural papaw flavour was absent until flavour was developed on the

tree in November. Varieties which have proved most satisfactory for a particular district were superior in appearance and quality to other types. Of the newer strains, Bettina 100A x Petersen 170 was the most outstanding in both flavour and appearance. The flavour of this type grown at Nambour, however, was much better than that grown in the metropolitan area.

Chemical Work.—Measurements of colour, firmness and chemical composition were made to determine what changes occur during natural and artificial ripening of papaws. The papaw ripens from the skin inwards and the apex section ripens first. The formation of sugar appears to cease when the fruit has attained full size but is still hard and green. In general, the softening of the flesh is accompanied by a change in skin and flesh colour. A milky latex present in the skin and flesh of immature fruit gradually disappears as the fruit ripens. Proteolytic activity and milk-clotting power of this latex will be determined in fruit at various stages of ripeness.

Canning.—Although the flavour of winter fruit artificially ripened is poor compared with that of fruit naturally ripened, this fruit, being of firm texture and good colour, is particularly suitable for canning. Of the 12 strains grown at Redlands Experiment Station, Yarwun Commercial had the most attractive flavour when canned, while one of the Bettina strains had the most attractive colour and texture. The marked expansion of cannery facilities in Queensland necessitates greater attention to the production of varieties suitable for canning. A canning variety should have a regular and roundish shape, firm texture, attractive appearance and small seed-cavity. Some of the types bred at Maroochy Experiment Station have these characteristics to a marked extent and cannery yields of over 60% have been obtained.

Quick-Freezing.—The summer crop of papaws is better preserved by quick-freezing than by canning because of its softer texture. The softening of the texture which occurs after the frozen fruit is thawed has been considerably reduced by immersing the fruit in a cold solution of invert and cane sugar at a temperature of 0°F. Although quick-frozen papaw is now available in Brisbane shops, standard packs of uniformly high quality can only be produced when sufficient material of attractive appearance, rich colour and firm texture is available. Special attention will therefore have to be given to breeding varieties suitable for quick-freezing.

STRAWBERRIES.

For some years, strawberry plantings have been limited only by the number of runners available. Although the area planted in 1951 was a record, the yields were low, mainly because the water available for irrigation was generally insufficient to ensure a full crop. Plantings for the 1952 season show a decline owing to a shortage of runner material following dry weather during spring and early summer.

Field Investigations.—Clonal selection within the variety Phenomenal has been continued. The project is a long-term one which follows the pattern so successfully used earlier in beans. A number of the best clones under observation in 1951 were planted again in 1952, and after further selection an improved type may be available for commercial propagation.

The field performance of runners differing in size and position with respect to the parent plant has been tested at Redlands Experiment Station. The peak period of harvesting was virtually the same for each type of runner. The crop was grown under irrigation with adequate amounts of fertilizer, and the results might be different under non-irrigated conditions.

Processing.—Increasing quantities of strawberries are being canned commercially, but the fruit tends to soften and lose colour after heating. Considerable attention has therefore been given to preserving strawberries by quick-freezing, but although the natural colour and flavour are preserved the texture of the fruit is particularly difficult to retain after the fruit has thawed. Some measure of success has been obtained by immersing the fruit in a solution of invert and cane sugar held at 0°F. The berries are then rolled in dry sugar, which removes the surplus liquid and considerably improves the flavour of the fruit. Although the berries rapidly soften after thawing, the initial freezing method resulting in very small ice crystals enables the fruit to be consumed in a semi-frozen state. Rapid thawing at atmospheric temperatures is more satisfactory than thawing slowly in a domestic refrigerator. In order to spread cannery operations more evenly, strawberries are being held by processors at very low temperatures for subsequent manufacture into jam.

MANGOES.

The mango is already an established crop in the dry tropics but elsewhere yields are variable owing to the fruit and flower damage caused by fungi. The fruit of the main commercial variety, Kensington, is excellent for the fresh-fruit market, and the major portion of the crop is marketed interstate.

Processing.—Both the common stringy mango and the stringless Kensington types can be preserved by canning or quick-freezing, and packs of very attractive appearance, rich flavour and good texture have been produced experimentally. Selection of fruit of desirable maturity is important, because unripe fruit is very acidic and of poor colour and flavour, while over-ripe fruit is of mushy texture and of slightly fermented flavour. Much of the objectionable fibre of the common type can be removed in the initial preparation of the fruit. The average yield of pieces suitable for canning or quick-freezing is approximately 40% of the original fresh-fruit weight, while an additional 20% of trimmings can be used for jam or purée. Very ripe common mangoes have a high percentage of juice which can be readily extracted and made into mango cordial. Although hand-preparation makes the processed article somewhat costly, it is anticipated that mechanical methods of peeling will be developed when the industry expands. As processing facilities are now available in North Queensland, the mango should be one of the main crops processed there, and a considerable expansion in the area under crop can therefore be anticipated.

MISCELLANEOUS FRUITS AND NUTS.

Prospects for expansion of Macadamia-nut-growing are not particularly bright, because worked trees of known performance are not yet available. Selected stock and scion material is now being propagated for subsequent establishment at Maroochy Experiment Station. This project should be the foundation of a new industry, as the quality of the nuts from selected trees is such that a market is assured for the product.

Production problems of the avocado are less acute than those of the Macadamia nut, for the main principles of orchard management have already been worked out in America. Some growers are already supplying southern markets with fruit of Fuerte and other varieties. Their interest in the crop is a guarantee that results from experimental work will be quickly applied in commercial practice. The Departmental programme is concentrated on the study of propagation methods and stock-scion relationships.

The popularity of the avocado depends mainly on the ability of the grower to pick fruit of highest quality, but the grower has to rely entirely on his own judgment as to when the fruit is sufficiently mature. The fat and oil content of the fruit increases with maturity, and equipment has now been obtained to enable this index to be determined very rapidly.

The custard apple is a minor orchard crop in the metropolitan district, but setting is notoriously erratic and no grower could possibly depend entirely on the crop for a living. Irrigation may be of value in stabilising cropping habits of the tree, but precise data on the point are not yet available.

Passion fruit was once a thriving crop in some parts of the State, but production is now far short of market requirements. The main contributory factor is the damage caused by diseases such as fusarium wilt, woodiness and brown spot. The crop is normally highly speculative, but at Bundaberg and Gayndah the position is more hopeful and the area under production there is actually expanding.

TOMATOES.

Cropping conditions have been very variable in the three main tomato districts of the State—Brisbane, Stanthorpe and Bowen. In the metropolitan area, water for irrigation was limited; growers could not plant normal acreages in spring, and autumn plantings were largely rain-grown. At Stanthorpe, early-summer plantings fared very badly, but storm rains later in the season built up soil moisture supplies, and some good crops were harvested before frosts occurred in May. At Bowen, conditions were generally favourable and a good crop was harvested in 1951. Some expansion in tomato production has occurred at Rockhampton and Bundaberg, but future market trends will probably determine its permanency or otherwise. The area under tomatoes during the past year was 6,000 acres, and production is assessed at 1¼ million half-bushel cases.

Of the four varieties, Q1, Q2, Q3 and Q4, which are grown for certification under Departmental supervision, Q2 is by far the most popular. It stands up to a wide range of climatic conditions, whereas the others show various defects at some times of the year in particular areas. The amount of certified seed produced during the current year was as follows:—Q1, 36 lb.; Q2, 200 lb.; Q3, 34 lb.; Q4, 48 lb.

A number of new varieties from Hawaii were examined at Redlands Experiment Station. In appearance, all were inferior to the standard types grown here, but one of them, Oahu, may prove useful. Seed has been retained and small stocks were supplied to North Queensland for trial.

At Stanthorpe, the seed now approved for certification and the original selections used at the inception of the certification scheme were compared in the field. No signs of deterioration in the plant-type were observed. However, as Q varieties are grown under a wide range of climatic conditions, it has been decided to widen the genetic constitution of mother-seed used for planting crops grown for certification.

Satisfactory results were again obtained in the field from sodium molybdate sprays in the tomato crop. It appears, therefore, that routine treatment with molybdenum and perhaps some other trace elements will become part of standard cultural practice on the red-brown loams of the metropolitan district. Unfortunately, there is a shortage of molybdenum salts in Australia at the present time.

BEANS.

After the setback to the industry caused by the drought, bean production showed a quick recovery. Heavy plantings were made in the autumn of 1952, and good rains ensured satisfactory crops. The market was glutted for some weeks, but after May supplies were barely sufficient to meet requirements. In 1951-52, half a million bushels were gathered from approximately 4,800 acres, mostly in the southern part of the State.

No certified seed was produced at Kingaroy in 1950-51 because of an outbreak of bacterial brown spot in the previous year. Reserve stocks of mother-seed were light, but these have now been increased sufficiently to permit the production of certified crops on a commercial scale in 1952-53. However, seed grown at Kingaroy outside certification, on contract to the C.O.D., should be much better than that available through ordinary trade channels.

Crop disorders through nutritional troubles again occurred in Gympie and other districts, the main symptoms being chlorosis of the leaves and stunting. Many of the affected soils are highly acid, with poor structure. Liming will be necessary in some areas before normal plant responses can be expected from the application of either major or trace elements.

OTHER VEGETABLES.

Cruciferous crops such as cabbage and cauliflower are grown extensively in southern Queensland. The market demand for small heads is increasing and this places a premium on quick-maturing varieties. Trials at Redlands Experiment Station have focussed attention on Golden Acre cabbage and the Snowball types of cauliflower. Seed of these and other varieties is rather variable. Most of it comes from the southern States and is derived from imported material. The practicability of growing seed locally is now being investigated.

The carrot is the most important root crop grown in Queensland. The two main problems in this industry are the development of a new variety to supersede Chantenay, which is very susceptible to mottle leaf, and better weed control. One of the most promising new varieties so far tested is Osborne Park, which performed particularly well at Stanthorpe last year, but some growers are also interested in the long-rooted Intermediate types of which improved strains are now available.

Power kerosene is widely used to control weeds in young carrot crops, but the method is not foolproof and other oils are now used overseas. White spirit has similar specifications to these oils, and tests were therefore carried out at Redlands Experiment Station. It has the same selective effect as power kerosene and treatment can be applied much later in the growing period. In one trial, however, yields were depressed in a carrot crop which was treated three times during the growing period. The plant reaction to this type of oil under repeated treatment is therefore uncertain.

QUICK-FREEZING OF VEGETABLES.

Periodical gluts of vegetables could probably be avoided by processing portion of the crop. Green vegetables, particularly, tend to lose colour and develop off-flavours after canning, but quick-freezing is a very satisfactory method of keeping vegetables over long periods. A rapid expansion of the quick-freezing industry can be expected now that commercial facilities are available in northern and southern districts. The research programme designed to determine optimum freezing and storage conditions, packaging methods and suitability of varieties will therefore have to be intensified. Investigational work has been greatly facilitated by the installation of a specially-designed cabinet in which temperatures of freezing and storage can be accurately controlled.

Breeding of varieties suitable for quick-freezing will be an important feature of field investigations, particularly with beans, where a stringless variety of good yielding capacity will be required for both northern and southern Queensland. The commercial varieties of French beans grown in Queensland are stringy types, and the cost of removing the fibre makes these varieties unsuitable for processing. Bountiful, a flat-podded type, has been the most promising of the five stringless varieties grown at Redlands Experiment Station in the current season. The average yield of this variety, however, has been less than that of comparable plantings of Brown Beauty. It may be possible to improve the yield by selection, and seed of desirable types has been retained for this purpose.

STORAGE OF POTATOES.

Investigations were carried out to determine whether portion of the southern Queensland potato crop could be successfully cool-stored from November until February, when supplies become available from Tasmania. Samples of Sequoia, Sebago and Exton obtained from commercial consignments were stored at 45°F. and removed after three months' storage. Provided the potatoes were in sound, mature condition at the time of storage, no appreciable loss in weight or wastage occurred. The effect of maturity was important, as wastage in mature potatoes was only 1% compared with 9% in immature tubers. The majority of the 30,000 bags stored commercially contained a considerable proportion of immature potatoes, as growers prefer to lift the crop early to reduce the risk of moth infestation. Until this maturity problem is solved, considerable losses must be expected during storage.

Certain fungi give potatoes an objectionable taint, irrespective of whether they have been cool-stored or kept at atmospheric temperatures. The development of these rots is accentuated when the bags are removed from cool-store to warmer atmospheric temperatures, causing moisture to be deposited on the cool surface of the potato. This can be avoided by placing the bags at a temperature of 55°F. and raising the temperature 15°F. each day for a period of three days. The variety Sequoia was superior in keeping quality to both Sebago and Exton.

TROPICAL CROPS.

Pepper and coffee are both potential horticultural crops in Queensland, but the future of each will depend very largely on world prices for the commodity. Commercial production is not likely to begin until price levels are stabilised, as considerable expense is involved in bringing each crop to maturity. In order to anticipate future plantings, both pepper and coffee have been established at Kamerunga Experiment Station, near Cairns. Both crops are making good progress.

EXPERIMENT STATIONS.

Maroochy.—The cropping programme at Maroochy Experiment Station was much the same as in the previous year, with the main emphasis on pineapples, bananas, citrus and papaws. In the pineapple areas, the work is concerned with plant improvement by mass selection and clonal selection, the fertilizer requirements of the plant, methods of crop management which will satisfy the requirements of soil conservation on steep slopes, weed control with chemicals such as PCP, and flower induction. In bananas, the area allocated to crop-control studies has been supplemented by a collection of both commercial and non-commercial varieties. Varietal improvement work in the papaw has particular reference to hybrids bred from Improved Petersen, Bettina and Countess. Some imported material from Hawaii, Florida and Brazil has also been established.

Progress has been made in impounding water for irrigation. One dam has already been completed and a second is in course of construction; their total capacity is approximately 3,000,000 gallons. It is hoped to have the reticulation system finished within the next two years.

Redlands.—The Manager's residence has now been completed and the temporary residence has been converted into offices for the technical staff in the South Metropolitan district. Additional land, about 21 acres, has also been acquired on the southern boundary.

The waterhole on Hilliard's Creek dried up in July 1951, and the experimental programme had therefore to be severely pruned. Long-term projects, such as strawberry and bean improvement, were continued, using the limited water available.

As the cropping programme depends so greatly on irrigation, the correct use of water is a major consideration. The relative merits of the several types of spray equipment were investigated, with particular reference to rates of application, water distribution and suitability for the red-brown loams in the area. The rate of water loss in soils which were clean fallowed, under perennial green crop, and under green crops regularly mown was also determined. The results obtained have an important bearing on methods of crop management in periods when moisture shortages are apt to occur.

Kamerunga.—The 17-acre area at Kamerunga, used by the technical staff at Cairns, provides scope for investigations in tropical and subtropical crops which are already grown in the North or likely to be grown there in the near future. A small amount of additional land has been acquired to straighten the boundaries, and the present borders will have to be re-designed. The cropping programme is much the same as last year.

Ayr Regional Experiment Station.—The horticultural block on Ayr Regional Experiment Station is concerned primarily with methods of pineapple crop management under irrigation. Work during the past three years has systematised times of planting, methods of flower induction and the practice of irrigation. Considerable progress has also been made in mechanising production methods.

EXTENSION WORK.

Field days have been held in several districts and at Maroochy and Redlands Experiment Stations. A recent innovation was a three-day tour by growers through the pineapple districts on the Near North Coast, at which developments in crop management were discussed by Departmental officers on selected properties. The Pineapple Consultative Committee, consisting of officers of the Department and the Committee of Direction of Fruit Marketing, meets regularly to discuss research and extension activities. A school for junior pineapple growers was again held at Nambour in August in conjunction with the Department of Public Instruction.

The revision of Volume II of the *Queensland Agricultural and Pastoral Handbook* is proceeding satisfactorily and it is hoped that the new text will be available by the end of 1952. The volume will be substantially larger than the original edition. Weekly press releases were again supplied to the official journal of the C.O.D. (*Fruit and Vegetable News*) and other appropriate papers. Each of these is an advisory article of some 1,200 words dealing with a problem of current interest.

Colour films on the harvesting, handling and packing of pineapples, tomato culture in southern Queensland and pineapple plant selection, prepared by Departmental officers, have attracted large audiences in a number of country towns.

Instruction in packing has been given to many growers, while packing classes have been conducted at schools in the Near North Coast district in conjunction with the Department of Public Instruction.

REFRIGERATED TRANSPORT.

A summary of investigations over a period of five years with Queensland refrigerated railway wagons has been prepared, and plans are being formulated for an experimental wagon which will cool hot loads during transit. Consignments can then be loaded direct from the orchard without the necessity of pre-cooling. In order to remove additional field heat, the capacity of the ice bunkers will have to be enlarged and fans installed to provide adequate air circulation. Radical changes in the design of fan cars have taken place in America, and three types of fans, driven by a friction drive off the wheel or by generators, have proved satisfactory for the transportation of perishable freight. The question of which type of fan can be best adapted to Queensland railway wagons is now being considered. Fan cars may play an important part in the distribution of frozen foods, as uniformly low temperatures can be maintained throughout the load.

MARKET INSPECTION.

There have been periodical gluts of beans, cucumbers, tomatoes and cabbage. Breakdown caused by gas burn has occurred in citrus fruits and in some districts losses have been heavy. Only a few cases of fruit have been condemned for immaturity. Because of drought conditions and severe hail damage in Stanthorpe, certain tolerances have been allowed for plums and apples in regard to size and percentage of blemish. During the season, inspectors were stationed at railway sidings in the Stanthorpe district to inspect apples for private-order trade. Many consignments of inferior quality were returned to the grower for re-sorting.

Both the summer and autumn crops of potatoes were fairly free from disease. Some consignments of the autumn crop were immature and blight was also present.

OVERSEAS EXPORT.

Exports of fresh fruit overseas have been the lowest on record during the post-war period, due to the high local prices, light crop and the competition of subsidised fruit from America. Approximately 6,000 cases of apples, 500 cases of citrus and 1,000 cases of pineapples were shipped from the port of Brisbane to Hong Kong, New Guinea, Noumea and New Zealand. Consignments of fruits and vegetables have also been air-freighted regularly to Noumea. The fruit shipped has been in good condition and received very favourable comment overseas.

Exports of pineapples to New Zealand are increasing and shipments are being made from Sydney and direct from Brisbane. Regulations are now in force making it compulsory for all pineapples for export to be packed in approved establishments situated in a locality in which pineapples are grown commercially. Forty sheds have now been registered in Queensland as approved export establishments for pineapples. Certain conditions regarding harvesting and packing have been prescribed and have resulted in a marked improvement in the condition of fruit arriving in New Zealand.

QUARANTINE.

Extreme vigilance has to be exercised by quarantine officers to prevent the introduction of plant material by migrants arriving in overseas vessels. Through the co-operation of the airways companies and the Customs and Postal Departments, many parcels containing plant material have been intercepted.

During the year, large quantities of timber in the form of logs, crates, sawn timber and prefabricated houses were imported. Because of the urgent demand for timber, many countries are not taking adequate precautions to ensure that only first-class material is being exported. Consequently, much of the material is of inferior quality and heavily infested with borers, bark beetles and timber wasps. Quarantine work has now become a main activity of the inspection team and more officers have had to be released from market inspection for quarantine duties.

Detection of Siricid wasps in imported timber, and subsequent treatment of infested timber, has been a problem. Should even one wasp be detected, quarantine measures involve either the destruction of material by burning or fumigation with methyl bromide. The stack is also sprayed every seven days with a mixture of DDT and BHC pending fumigation. Special facilities for fumigation have been erected by the Commonwealth Housing Commission at Stafford, but larger and more accessible facilities will be required if timber imports continue to increase. Quarantine measures would be difficult to implement without the complete co-operation of importers and shipping companies.

Nursery-stock regulations have had the desired effect of restricting importation of planting material to Government Departments or firms having the necessary facilities for carrying out post-quarantine measures.

Active steps are being taken by means of films and exhibits at the Royal National Show to inform the public of quarantine measures being taken to prevent the introduction of foreign pests and diseases.

HORTICULTURAL CROP STATISTICS.

(Source : Queensland Government Statistician).

Apples.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	3,320	252,756	76
1946–47	4,742	445,187	94
1947–48	4,911	455,254	93
1948–49	4,823	361,830	75
1949–50	4,522	536,742	119
1950–51	4,740	448,129	95

Bananas.

Year.	Area in Bearing.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	6,016	651,558	108
1946–47	6,145	617,010	100
1947–48	6,616	585,895	89
1948–49	6,325	611,605	97
1949–50	5,734	533,960	93
1950–51	5,240	548,056	105

French Beans.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	2,733	267,842	98
1946–47	5,222	321,904	62
1947–48	4,842	456,929	94
1948–49	4,529	449,132	99
1949–50	4,579	509,931	111
1950–51	4,809	512,964	107

Citrus.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	3,303	349,180	106
1946–47	4,230	506,832	120
1947–48	4,217	480,419	114
1948–49	4,240	584,301	138
1949–50	4,373	494,640	113
1950–51	4,355	597,212	137

Pineapples.

Year.	Area in Bearing.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	4,766	1,624,362	341
1946–47	4,907	1,535,139	313
1947–48	6,175	2,073,472	336
1948–49	6,469	2,119,011	328
1949–50	6,807	2,374,748	349
1950–51	6,957	2,507,391	360

Tomatoes.

Year.	Area.	Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Average 1935–36 to 1939–40	5,137	502,171	98
1946–47	7,605	710,139	93
1947–48	6,759	735,715	109
1848–49	5,632	635,734	113
1949–50	5,589	643,246	115
1950–51	6,069	614.914	101

SCIENCE BRANCH.

Mr. J. H. Simmonds, Officer in Charge.

The report of the Science Branch covers the work of the three sections of Entomology, Plant Pathology, and Botany. As much of the work of these sections is distinct, it is discussed separately here. The head of each section has been largely responsible for the subject matter of the report.

BOTANY.

A large number of specimens, totalling approximately 10,000, was identified during the year, and in most cases advice on economic properties was supplied. A large proportion of the specimens emanated from landholders and the general public. The remainder were chiefly from field officers of the Department and the Departments of Forestry, Public Lands and Public Instruction. Material submitted by officers of the C.S.I.R.O. included a large collection, chiefly from trees in New Guinea, made in connection with the Organization's drug-plant survey. School Project Clubs have also maintained a steady flow of specimens for identification. Some of these were for the purpose of labelling trees in the school grounds, a practice which is becoming more prevalent.

Although native plants and introduced weeds constituted the bulk of the material dealt with, a fairly large number of cultivated and ornamental plants were identified. Advice was given to correspondents seeking information concerning the planting of trees and shrubs for shade and windbreaks. Technical botanical assistance was also rendered to the Police Department.

There was a high mortality amongst stock during the dry spring and summer. In consequence of this, an unusually large number of plants and paunch contents were received in connection with suspected poisonings. At that time of the year, too, many inquiries were received for information regarding suitability of various trees for drought-feeding. The shortage of grass and herbage also awakened some interest in the planting of fodder trees as a future reserve.

Subsequent to the late-summer rains, there was a marked increase in the number of weed specimens received and information concerning their control was furnished. Linked with the clearing of new land for various purposes was the application for advice on the killing of standing timber and undergrowth made by many farmers during the autumn.

Apart from botanical identification and advisory work, and studies in systematic botany, the activities of officers have also included field work on weed control and surveys and vegetation studies of various types.

Periodic inspections have been made of the plots of brigalow (*Acacia harpophylla*) treated with a 2,4-D/2,4,5-T mixture as a low-volume, aerial spray. While most of the trees treated with 2-3 lb. of this hormone per acre have died or appear to be dying, observations in the spring will be necessary to see if any subsequent suckering takes place. Should the method prove to be economically practicable, it could lead to a widespread opening up of new land, as well as providing a useful means of controlling brigalow suckers in land already cleared.

Experiments on the control of Russian knapweed (*Centaurec. repens*), using 2,4-D and 2,4-D/2,4,5-T mixtures, and hoary cress (*Lepidium draba*), using sodium 2,4-D, are in progress. A small trial spraying of black bindweed or climbing buckwheat (*Polygonum convolvulus*) suggests that 1 lb. per acre of sodium 2,4-D in the pre-flowering stage, while it does not kill the plant, will prevent flowering and cause the stems to lose their capacity to twine on the wheat, without harming the latter.

Close liaison has been maintained with the Co-ordinating Board and the Biological Section of the Department of Public Lands, which are also engaged in weed control. Assistance in locating suitable stands of weeds for their experiments has been rendered. A joint weed survey of the tropical coast and hinterland between Townsville and Daintree was also carried out. This will enable a better appreciation of the weed problem in that area and provide a basis for more satisfactory future planning of experimental work.

Arising from an inter-department conference, the Botany Section was charged with carrying out an ecological survey of the areas infested with lantana. As a preliminary step, a questionnaire was prepared and circulated to field officers in coastal and sub-coastal districts. Replies received contain data which will be useful as a basis for more detailed field study. During the North Queensland weed survey, special attention was paid to lantana in the localities visited.

Visits to properties were made in company with Departmental veterinary officers with a view to locating the cause where plant poisoning was suspected. At Ardmore, in the Dajarra-Urandangie area, a botanical survey was made of small paddocks being used for grazing trials in connection with investigations into Georgina River disease. A brief botanical survey was made of paddocks in the Ravenswood district, where "walkabout" disease in horses is very prevalent.

In association with other officers of the Department, an ecological survey of "Brian Pastures" Research Station, in the Gayndah district, was made. Assistance in the field was rendered to the Bureau of Investigation in connection with a land-utilization survey of the eastern portion of the Darling Downs.

Two visits were paid to North Queensland by officers of the Section; during both, extensive collections of plants were made and a number of previously unknown plants discovered. On one, the vegetation of Hinchinbrook Island and the Mt. Fox-Wallaman Falls area was studied. Previously little botanical collecting had been done in these localities. On the other, an officer accompanied a C.S.I.R.O. drug-plant survey party for the purpose of making field identifications and assisting in locating material required for testing. The main centres examined were the rain-forest areas of the Eungella Range, the Clump Point-Mission Beach-Lacey's Creek region, and the Evelyn Tableland.

As well as several smaller papers, one dealing with drought in semi-arid pastoral Queensland, written in collaboration with officers of the Sheep and Wool Branch, was submitted for publication. The manuscript of a weed handbook is being revised and information brought up to date with a view to ultimate publication. Additional photographs of weeds for inclusion have been obtained. Several talks on subjects of interest to the man on the land have been given at field days and on appropriate wireless sessions.

Further progress has been made in determining the Cape York collection of plants made by the Archbold Expedition in 1948. It contains a number of previously undescribed species as well as plants not known before to occur here. Amongst other larger collections dealt with during the year was one made in the Northern Territory by Mr. C. E. Carter, of the Forestry School, Canberra. Another made in connection with studies on fruit flies was received from an officer of the Entomology Section. With the present utilization of a greater variety of tree species for timber purposes, many specimens have been received from the Forestry Department, including some larger collections from North Queensland.

It was often found necessary in the course of routine identification work to carry out revisionary systematic studies on the particular groups involved. This has necessitated the borrowing of material, including type specimens, from other State herbaria and occasionally overseas herbaria. At the same time, material of other groups has been lent for study to botanists in other

institutions, both in Australia and abroad. In this way, reference collections of plants in the Queensland Herbarium are gradually being more carefully arranged, notes are accumulating for later amplification and publication, and a more detailed knowledge of the flora of the State is being gained. Herbarium collections are being augmented by material obtained during field trips, and field notes on the plants are being gathered. Exchanges with overseas institutions have resulted in additions to our collections of exotic plants. Co-operation has been maintained with workers engaged on the preparation of *Flora Malesiana*, specimens having been both received here for study and sent out on loan.

PLANT PATHOLOGY.

The spring and early-summer period was noteworthy for being one of the driest on record. As a result of this, diseases usually common at this time were rare or entirely absent. Field trials on disease control are dependant on a satisfactory level of disease intensity for their success, and during the past year many of those undertaken yielded little or no results for the work put into them. Some resolved themselves into a test of the phytotoxic effect of the chemicals used rather than a test of their fungicidal properties. The experiments most seriously affected by the abnormal weather conditions included those concerned with the following:—the control of brown rot of peaches and nectarines (Stanthorpe); the control of grey mould of grapes (Glen Aplin); the control of downy mildew of onions (Lockyer Valley); the control of downy and powdery mildews of rockmelons (Gayndah); and the control of base and top rots of pineapples by dipping the planting material (Nambour).

In the case of the last two, information on the phytotoxic effect of the fungicides used was obtained, while in the onion experiment the most satisfactory spreader for obtaining complete wetting of the onion foliage was investigated.

The most unfortunate feature of the failure of these experiments is that satisfactory local information on the new range of organic fungicides, which have recently been introduced by a number of firms, is not yet available.

Cereals.

While rust did little damage to the wheat crop, powdery mildew was more serious than usual; however, it did not prevent the harvesting of good crops. The node blight caused by *Septoria nodorum* was again in evidence. This recent invader of wheat crops is being carefully watched to see what influence, if any, it will have on wheat production.

In recent years the use of crown-rust-resistant types of oats for grazing on the coast has become increasingly popular. The planting of Victland and similar varieties is limited only by the availability of seed, which was in reduced supply due to stem rust in the seed-producing regions in 1950 and to drought in 1951. Recently the serious Helminthosporium blight (*Helminthosporium victoriae*) has occurred in the Victoria crosses and appears likely to render these of little value on the moister river flats. Fortunately, oat crosses with Bond parentage are showing resistance to both crown rust and the new blight and when these are commercially available they should retrieve the position.

Owing to the absence of early rains, maize crops were mostly planted late in the season, and in the Mary Valley and coastal areas blight (*Helminthosporium turcicum*) was prevalent towards the end of the season. In some crops already harvested, cob rot (*Diplodia zeae*) was in greater evidence than usual, but it is too early to say whether this is general.

Field Crops.

Purple top wilt (tomato big bud virus) was a serious factor in the autumn potato crop in several districts. In the coastal areas bacterial wilt was more severe. The potato rotation trial in connection with purple top wilt has been continued and the season's yield figures are awaiting statistical examination.

The potato varieties Menominee and Ontario have now been tested in scab-resistance trials under both spring and autumn conditions in the Lockyer Valley. Their advantage in resistance to scab disease is overshadowed by their inability to yield as well as the standard varieties. Several other newer varieties have been included in a more recent scab-resistance study.

During the summer months a stem rot of Poona pea was recorded for the first time in widespread areas of south-eastern Queensland. In many crops examined, infection around the 70%-80% level was common. Affected plants are usually completely dead in the root zone, with an extensive red-bordered lesion extending well up the stem. Isolations have yielded a species of *Phytophthora* which proved pathogenic to cowpea. It is difficult to explain the extensive distribution of a disease of this nature hitherto unrecorded in the State.

Owing to the losses from field blue mould in early-planted tobacco crops in North Queensland, seedbed experiments have been initiated with a view to testing some of the newer fungicides against this disease. The first was inconclusive, owing to the uneven distribution of the disease. A second trial, with modifications which should enable more precise information to be obtained, is now under way. A field trial using the more promising fungicides from the first seedbed experiment is also being conducted.

Subtropical Fruits.

The experiment on brown spot of Emperor mandarin at Burrum has been completed and the yield figures analysed. The dry year resulted in a rather low incidence of the disease and the results were not statistically significant. However, the cuprous oxide schedule including pre-blossom applications was again the best treatment, closely followed by cuprous oxide plus zinc. These treatments have given the best results over three seasons and a combination of the two appears to be the most promising method of control. Observational trials have been commenced on two orchards at Palmwoods to check the efficiency of the proposed schedule in comparison with current practice.

Much prominence has been given in recent years to the various virus diseases of citrus trees. Advantage has been taken of the increased knowledge on this subject to survey the position in Queensland, particularly with reference to stem-pitting of grapefruit and decline in mandarins. The first objective will be to secure a source of budwood reasonably free from virus.

In a trial of various dips for the control of blue mould in Emperor mandarins, the standard borax-boracic acid plus wax emulsion treatment gave significant control of mould. It gave no control of stem-end rot (*Phomopsis citri*) and caused fruit injury. Salicylanilide plus wax emulsion, while less efficient in controlling mould, gave good results with stem-end rot, and it would appear that this is the best fruit treatment for coastal areas where the latter disease is prevalent.

During the past three or four years there have been isolated instances of mature avocado trees dying with symptoms closely resembling those recorded elsewhere for avocado "decline." In one locality, one-third of a block of 270 trees died out in this manner. *Phytophthora cinnamomi* has been isolated from the roots of declining trees, but so far all attempts to reproduce the symptoms in potted seedling avocadoes by inoculation with this organism have failed.

The strawberry runner approval scheme was carried through a further year in co-operation with officers of the Horticulture Branch. Sixteen of the 31 original applicants received approval. On the North Coast, drought effects on unirrigated plantings were the chief causes for rejection. In the metropolitan area, eight growers failed to comply with requirements on account of virus infection and 10 because of poor cultural standards or the presence of nematodes.

Tropical Fruits.

Investigations into the practicability of controlling banana leaf spot (*Cercospora musae* and *Cordana musae*) in North Queensland by spraying have been continued. Bunches are now maturing on the experimental area and are being weighed at the time of harvesting, when leaf-spot assessments are also made. An analysis of the data assembled so far indicates that there will be no pronounced difference between the number of leaves on sprayed and unsprayed plants but that there will be considerable differences in the amount of leaf spot present. As yet, there is little difference in the weight of bunches from sprayed and unsprayed plants, but as the fruit on unsprayed plants is maturing

more quickly differences may become apparent later. Under North Queensland conditions, reduced ripening rate in itself may result in considerable saving of loss during marketing.

In the south-east assistance has been rendered in selecting Lady Finger and Sugar banana plantations as sources of Panama-disease-free planting material. The scheme for the approval of planting material of these varieties has been in operation now for three years and it would appear that it has been of considerable value in restricting the spread of this disease.

The past year was one of the worst on record for dieback in papaws. An outbreak in the spring continued sporadically over the autumn. Plantings in their first and second year of bearing suffered most severely and not infrequently there was the unusual experience of plants succumbing in the pre-flowering stage. Losses of up to 80% were recorded.

The incidence of dieback in the papaw varietal trial at Redlands Experiment Station was complicated by frost injury and no evidence of varietal resistance to the disease could be obtained from this plot. In the resistance trial at Aspley, dieback incidence has been considerable, but here again no definite evidence of resistance in the selected strains is as yet forthcoming.

Throughout the past fruiting season, extensive assessments of fruit-spot incidence in the different varieties of papaw growing at Redlands Experiment Station were made. The data obtained have not been fully analysed, but there is evidence of considerable varietal differences in susceptibility to the ripe-fruit rots.

Vegetables.

In common with other crops, vegetables suffered more from dry weather during the greater portion of the year than from parasitic disease. Blossom-end rot of tomatoes was particularly severe till the season changed; during the last few months target spot (*Alternaria solani*) became unusually prevalent.

The opportunity was taken to make observations in the bean variety trials and Brown Beauty bean strain trials conducted by the Horticulture Branch. A few varieties not normally grown in Queensland were found susceptible to *Pythium* wilt. Variations were noted in susceptibility to rust, which has become serious in recent years, and to halo blight, anthracnose and mosaic. Four strains of Brown Beauty which are immune to common bean mosaic and one strain with high resistance to anthracnose have been found. A field trial to test the effect of common bean mosaic upon yield has been completed; infected plots showed a reduction of 18% on healthy plots of the same strain.

Trace infections with bacterial disease have caused considerable concern in the production of certified bean seed. Attention has been paid to the separate determination of the various bacterial spots present. Bacterial brown spot (*Pseudomonas syringae*) has been found to be more prevalent than previously believed. In addition, it now seems that a previously unrecorded thrips-transmitted bacterial disease is widespread in seed-stocks and much attention has been given to determining its importance. It is considered that field identification of the various bacterial diseases of beans is sufficiently practicable to permit a tolerance for the mild diseases while still excluding the serious forms.

Two replicated field trials, in which four new lines of disease-resistant tomatoes have been tested, were conducted during the year. Although there appear to be some commercially suitable types within these lines, they have not been field tested to a sufficient extent to enable a true estimate of their disease-resistant qualities to be made. Some seed will be released to growers in the coming spring in the hope of gaining more information.

The pre-emergence rotting of peas which is serious under wet conditions was shown to be readily controlled by seed treatment. The copper and mercury treatments were moderately effective, but better results were obtained with Tetroc. This material has the further advantage of not interfering with inoculations with *Rhizobium*. Spray trials against cabbage downy mildew in seedbeds were somewhat inconclusive, and will be repeated at the first opportunity.

Forests.

An outbreak of stem blight (*Phomopsis* sp.) was recorded on hoop pine at the Amamoor nursery. The spread was checked by a programme of copper spraying.

A seedling-root-rot of hoop pine occurring in several forestry nurseries was shown to have a *Fusarium* associated with it. The disease has been reproduced in pot inoculations using this organism.

In North Queensland, attention has been given to the butt rot of hoop pine, maple and silky oak occurring there and evidence obtained recently may lead to a knowledge of the cause of this trouble.

Legume Inoculum.

The legume inoculum service continues to increase in popularity. In spite of the dry year, 1,365 growers were supplied with inoculum in various quantities, compared with 1,190 in the previous 12 months. Farmers in distant centres now receive their inoculum by air-freight.

ENTOMOLOGY.

Drought relieved by an occasional storm or light rain prevailed in most districts until February. In last year's report it was recorded that excessive rain caused breakdowns in commercial pest controls; during the spring and summer of the 1951-1952 period poor growing conditions for many crops also modified outlays on insecticidal spraying and dusting. These conditions activated the nematode *Heterodera marioni* (Cornu) Goodey, and during the summer serious damage to a large range of commercial and home-garden crops occurred throughout the State.

Deciduous Fruits.

There has been a natural decline in red scale (*Aonidiella aurantii* (Mask.)) populations on figs in the Sunnybank district. An intensive investigational programme, which was continued for three seasons, has been concluded satisfactorily with a better understanding of the commercial aspects of this problem.

Exploratory work and some population sampling with the grape scale (*Eulecanium persicae* (Geoff.)) have proved sufficient for present extension needs. Any expansion of spraying trials must await another reappearance of this pest in numbers sufficient for experimental purposes.

Weather conditions influenced the incidence of codling moth (*Cydia pomonella* (L.)) and peaks of moth emergence were not as well defined as usual. The possibility of poor crops following hail damage in the Granite Belt induced growers to economise on spraying, and infestations by this pest were the most numerous for some years. Larval entry was often located in hail-damage spots, which made recognition difficult. The position was aggravated further on some orchards by reversion during the previous season to lead arsenate treatments. The light-brown apple moth (*Tortrix postvittana* (Walk.)) was not prevalent, and damage was virtually absent from both leaders and fruit.

Infestations of red spider (*Tetranychus urticae* Koch.) were present in many orchards, but bryobia mite (*Bryobia praetiosa* Koch.) was of little importance. The unusual weather appeared to have created difficulties with standard control methods, but work on mite trials is providing valid and useful results. The objectives of this project, which covers DDT, Aramite, E.605, lime sulphur, wettable sulphur, white oil, and dormant and semi-dormant oils, are the better timing of spray applications and the evaluation of different responses to these materials by Eriophyids and the two better-known mites.

Fruit Flies.

Commercial infestations by fruit flies were not as widespread and severe as in the previous season, although a few orchard losses were recorded during late summer and early autumn in coastal areas. Investigational work on these pests has been intensified and extended. A host survey was made in districts between Rockhampton and the Daintree River, and trapping stations have been established on widely spaced sites

in coastal districts. As can be expected with this type of work in its earlier stages, interpretation and evaluation of the considerable amount of new data present many difficulties. Plans for further work, including a detailed study with insecticides, are well advanced.

Citrus.

Commercial control programmes were abandoned in many districts during the dry months. This was due to preoccupation with intensified irrigation, or in some districts to the certainty of damage to trees and crops following any spray applications. Hot weather decimated white wax (*Ceroplastes destructor* Newst.) populations, but some of the other pests, particularly scale insects, will need special attention in the future. In late-December large numbers of the bronze orange bug (*Rhoecocoris sulciventris* (Stal.)) caused severe damage in parts of the North Coast, and fruit-sucking moths (*Othreis* spp.) were troublesome during March. Minor scale species, such as mussel scale (*Lepidosaphes beckii* (Newm.)) and white louse (*Unaspis citri* (Comst.)), have become more prominent than usual and may need checking. On a Gayndah nursery, trifoliata stock (*Poncirus trifoliata*) became heavily infested by a small wasp (*Eurytoma* sp.), but this is considered to be of little economic importance.

All research with citrus pests initiated was carried through, but weather and growing conditions interfered seriously with most field trials. Sodium fluoroacetate was again responsible for kills in citrus gall wasp (*Eurytoma fellis* Gir.) plots. The most significant result from spray-screening tests against white wax is the difficulty in killing this pest in the ovipositing stage.

Tobacco.

Nematodes were severe where any growth checks due to shortage of soil moisture were experienced, and some poor responses to DD treatment were reported. As with any successful soil fumigant, the work must be done thoroughly, and methods of DD application in tobacco fields require further study and attention. Observations on nematodes in a rotation trial were continued for the fourth successive year, but results still remain inconclusive.

In most districts throughout the State, attacks by the budworm (*Heliothis armigera* (Hb.)), and the looper (*Plusia argentifera* Guen.) were severe, and where control was not achieved losses were heavy. Detailed screening tests against the looper were carried through at Ayr, using several of the newer insecticides. Dieldrin gave rapid and heavy kills, and at 0·1% strength was the best treatment, being slightly superior to the standard DDT—lead arsenate mixture when both were used correctly. Taint trials indicated that BHC, chlordane and toxaphene should not be used in Queensland tobacco-fields.

Potato.

During late spring, field infestations of the potato tuber moth (*Gnorimoschema operculella* (Zell.)) were severe in the Lockyer district where DDT was not used. Northern crops were comparatively free from this pest. An investigation of potato pests has been finalised, and practical and economic controls in the field and in storage have been demonstrated. There is now available relevant information to cover a wide range of conditions which may arise.

Grains.

The poor supply of suitable fumigants leaves the commercial control of grain pests, an important problem, in an unsatisfactory state. Dusting of grain as a means of control has been carried out up to the present to a limited extent only.

Investigational work with dusts has been expanded, with special attention to the effects on germination of long-term storage with BHC and DDT. The early promise of pyrethrum-piperonyl butoxide dusts as short-term grain protectants has not been substantiated. Studies of the control of grain pests, including field surveys of weevil (*Calandra oryzae* (L.)) incidence, are being continued.

Vegetables.

Nematodes, mites, thrips, aphids, the green vegetable bug (*Nezara viridula* (L.)) and leaf miners remain the most troublesome pests of vegetables. Nematodes were severe even in bean crops, which usually escape this pest. In the Toowoomba and Gatton districts the green vegetable bug damaged tomatoes and beans, onion thrips (*Thrips tobaci* L.) was generally troublesome on tomatoes and beans and red spider infested beans and sweet-corn. In the near-metropolitan districts, the effects of dry weather were accentuated also by red spider infestations of several crops, including beans, cucumbers and carrots, and by aphids on late cabbage. Larvae of leaf-mining flies attacked cabbage, lettuce, radish and peas. On the North Coast, red spider was present on the few small-crops grown as well as on bananas and citrus.

In the Bowen district, a field trial with miticides against the tomato mite (*Phyllocoptes lycopersici* Massee) yielded satisfactory results towards an improved schedule under conditions favourable to the presence of this pest. Trials covering bulb and seed yields were continued against the onion thrip in the Lockyer District, and valid experimental data were obtained. There are still doubts, however, on the economic aspects of spraying or dusting against this pest, and to clear the project further work is planned. A number of experiments using modern miticides as dusts and sprays have been concluded against red spider on several crops. Also, autumn screening trials with insecticides against the cabbage leaf-miner (*Liriomyza cruciferarum* Her.) were set out in cabbage seedbeds. This pest has been troublesome in the Redland Bay district, attacking cabbage at all stages of growth and reducing the number and quality of marketable heads. The aphid *Brevicoryne brassicae* (L.) was common on seedling cabbage and cauliflowers in the Toowoomba district, and was responsible for some leaf-rolling and stunting. Various preparations of DDT have been tested on young tomato plants. Although there is evidence that some depress growth, yield data are still required. Further liberations of parasites of the cabbage moth (*Plutella maculipennis* (Curt.)) and the cabbage white butterfly (*Pieris rapae* (L.)) have been made. One of these (*Angitia cerophaga* (Grav.)) is now well established in the original liberation sites at Westbrook and Gatton.

The coastal brown ant (*Pheidole megacephala* (F.)) has been troublesome, particularly in home gardens and on some small-crop farms at Cooper's Plains, Sunnybank and Rochedale.

Cotton and Related Crops.

Only the rough bollworm (*Earias huegeli* Rog.) appeared to any extent in cotton, noticeably in the young crops in the Ayr district, although ultimate yields were seldom adversely affected. This pest was also present in experimental plantings of kenaf (*Hibiscus cannabinus* L.), but there is no positive evidence to date that attacks by pests may reduce the fibre yields of this plant in Queensland.

Miscellaneous Field Crops.

Infestations of linseed by *Heliothis armigera* (Hb.) were again at a low level, and this precluded satisfactory data from the extensive field trials which were set out.

A survey for midge (*Contarinia sorghicola* (Coq.)) was made in the principal sorghum-growing areas on the Darling Downs. There were few early-planted crops, and although this pest was present in most fields, damage was negligible. Large-scale insecticidal field work therefore was not practicable, and efforts were confined to life-history studies and other aspects of the problem of midge control. This pest was bred on two occasions from a grass. A fact of interest is that BHC dusts do not kill the midge diapause stage, which is often associated with sorghum seed.

Grass grubs (*Hepialidae*) have caused damage to pastures on the Atherton Tableland and in the Eungella district, near Mackay. Armyworms were reported as attacking pastures in several localities. Damage by funnel ants (*Aphaenogaster* spp.) was investigated on the Near North Coast. These ants were troublesome in many coastal localities in pastures and on golf-courses. While the use of chlordane was found to be a satisfactory control under limited circumstances, its extension to the wider economic problem is still a matter of consideration with due regard to costs.

Tropical Fruits.

Insecticide trials against the banana weevil borer (*Cosmopolites sordidus* (Germ.)) have been extended, and a new approach to the control of this pest is being attempted. In addition, investigational work on the residual effects of some of the modern persistent insecticides in soil has been commenced.

Spasmodic damage by white grubs to pineapples has been recorded from several districts.

Miscellaneous.

A first record in Queensland of the leaf nematode (*Aphelenchoides ritzema-bosi* (Schwartz) Goodey), was made at Toowoomba, where it is widespread in chrysanthemums in nurseries and home gardens. Reasonably good control was obtained with E.605 sprays.

A wave of Rutherglen bug (*Nysius vinitor* Berg.) occurred during September and October. Some crop damage by nymphs was evident, but it was comparatively light and DDT sprays gave satisfactory control where necessary.

As numerous complaints about ants were received, a survey of wharves, railway stations and other points of entry to south-eastern Queensland was made, but the Argentine ant (*Iridomyrmex humilis* (Mayr.)) was not found.

Three wood wasps—*Sirex juvencus* L., *Urocerus gigas* L., and *Xeris spectrum* (L.)—were identified from timber imported during April.

An outbreak of the red-shouldered leaf beetle (*Monolepta australis* (Jacoby)) on the Near North Coast during January caused severe damage to some plantings of mangoes and citrus.

The white-fringed weevil (*Pantomorus leucoloma* (Boh.)) appeared for the first time in strawberry crops in the Ormiston district. Grubs of the black beetle (*Metanastes vulgivagus* (Oll.)) were also present.

Beekeeping.

The year was not favourable for honey production. Another small outbreak of American foul brood (*Bacillus larvae* W.) occurred in an apiary of a migratory beekeeper in the south-western district. This entailed a heavy inspectional programme, but no further disease was found. The moving of apiaries from district to district has been practised extensively in recent years, and has helped in producing large honey crops. There has been, however, a significant increase in diseases, and in south-western Queensland, where interstate movements take place, the introduction of foul brood has given rise to anxiety within the industry. A certain amount of migration will always be necessary, but beekeepers should adopt a thoughtful attitude in regard to the movements of apiaries if restrictive disease control measures are to be avoided.

Fauna and Flora Protection.

Advisory, educational, inspectional and administrative aspects of fauna protection have been given constant attention. Seventeen prosecutions for shooting wild duck during a close season or for shooting on sanctuaries were recorded. New fauna legislation was passed during March, and comes into force on a date to be proclaimed. This new Act is designed to improve the conservation of our native birds and mammals.

Several special permits for scientific purposes were authorised under *The Native Plants Protection Act of* 1930, and routine administration of the Act was given attention.

CHEMICAL LABORATORY.

Dr. M. White, Agricultural Chemist and Biochemist.

The year under review was divided into a rainless period of hardship and a delayed wet season of favourable and well-distributed rains. The laboratory operates almost exclusively for the benefit of rural production, so the pattern of its routine operations is largely governed by the seasons. This is well illustrated in the chart (Fig. 1) showing monthly submissions of waters and cattle-dipping fluids. When supplies had failed or had become so polluted as to be unfit for stock, well-sinking or the reopening of disused or neglected shafts brought increased numbers of waters for testing. Many were known from previous histories to be of doubtful quality and very little change had taken place. New recordings for unsuitable ground-waters were made and these are all being fitted into a system of plotting which will be used for area-mapping so that the chances of obtaining good water on sinking may be assessed. It is worth noting that on several occasions it was found possible to treat muddy waters in earth tanks or dams with heavily mineralised waters and effect a clarification; thus two unsuitable waters exerted mutually beneficial actions—clarification and dilution—which resulted in potable water. With the coming of summer rains, water submissions fell sharply, while the increase in dip numbers reflected increased activity of summer pests.

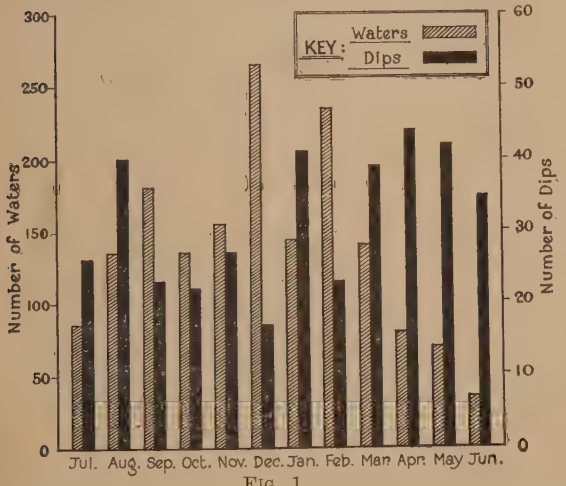


FIG. 1.

WATER AND DIP ANALYSES.

The laboratory investigations have covered (*a*) salinity affecting waters, soils and plants; (*b*) poisons in soils, waters and plants; (*c*) earths eaten by stock, and (*d*) materials suspected of being involved in stock losses. These are treated in greater detail under the sectional headings wherever results of interest or importance have been obtained.

TOXICOLOGY.

The widespread use of arsenical compounds for timber-poisoning, weed control and cattle-dipping vats over the past 60 years has induced the familiarity that begets carelessness. Until the introduction of halogenated insecticides (DDT, BHC, chlordane, etc.) and plant-killing hormones (2,4-D, M.C.P.A., etc.) the laboratory annually recorded over 90% of fatalities among farm animals as arsenical poisoning.

The position has changed—and quite suddenly. Lead is assuming a disproportionately high place in the hazard group. It might reasonably be expected that ignorance rather than carelessness is responsible. Lead is a cumulative poison, so long-continued ingestion of small amounts will just as surely poison as less frequent intakes of larger quantities. The owner is, therefore, not so alert to symptoms as in the case of acute poisoning. A warning seems necessary.

Country low in available phosphates produces fodder low in phosphate, and this, in turn, affects grazing animals. Cattle so affected early exhibit abnormal appetites and show marked craving for sticks, stones, bones, ashes, tins, wire, cartridge shells, etc. They are unable to distinguish poisonous from non-poisonous metals. During the year, burnt paint residues, solder, car batteries and drums have all been found associated with lead poisonings. Unfenced rubbish dumps are the worst menaces, and "coasty" or "soft-bone" cattle the most likely to be affected but there are two clear-cut cases where care is urged—(*a*) the disposal or use of lead-containing paint, more especially when it is rendered attractive to stock by linseed oil; and (*b*) the use of contaminated drums for storage of molasses.

Nitrates have attained prominence since it was shown that some well waters in Queensland owe their toxicity to nitrite derived from the nitrate. Further cases have been found. The work is being extended to cover nitrates in plants. This poison has long been known to accumulate in plants grown on soils rich in nitrogen or following the use of nitrate of soda. Insufficient available manganese and/or molybdenum is now known to halt the normal use of nitrogen in the plant at the nitrate stage. These are not yet serious risks to stock, but a third mechanism is. It has been shown not only that certain plant hormones increase the amount of nitrate in the wilted plant, but that some stock actually prefer certain plants when they have reached this stage of danger. The laboratory is checking these points because of the obvious risk on stock routes and newly cleared and poisoned country.

The Section handled a total of 979 samples during the year.

BIOCHEMISTRY.

The services that this section provides in the fields of general nutrition, blood and tissue examination and micro-nutrient (trace element) assays have been expanded. This has been possible by transfer of the animal biochemists to Yeerongpilly Animal Health Station, where the experimental animals are housed, and by purchase of new apparatus. The plant biochemists remain at the parent laboratory. The routine work, which involved analyses of nearly 2,000 specimens during the year, is concerned with the examination of body fluids and organs for essential elements or for metabolites which will aid in diagnosis or confirm other tests. The research programme is essentially that reported in other years, but several projects have reached the stage of publication.

Copper.

The difficulties of administering copper to stock in copper-deficient zones, where absence of daily handling and low carrying capacity are limiting factors, are well known. The laboratory has sought to overcome these practical and economic difficulties by administration to sheep and cattle of sufficient copper at one treatment to last several weeks. Copper preparations of many types—organic and inorganic, soluble and insoluble, active and inactive—have been used, and the methods employed have ranged from intravenous, intramuscular and subcutaneous injection to implantation. Even when copper storage was adequate, a treatment has been classed as a failure if it was either impracticable in the field or damaged the animal. These severe strictures have made the number of hopeful leads small, but two lines of enquiry are yielding results. It has been possible to formulate copper compounds which are soluble, non-toxic, easily administered, cheap, and almost foolproof. These are now being tested for duration of effectiveness. Much of this work was presented to the 1952 annual conference of the Australian Veterinary Association and has been prepared for publication.

Fluorosis.

The long-term studies on fluorosis have reached a stage at which laboratory-scale work is complete. When the outstanding analytical work has been done, the whole will be transmitted for publication.

It seems quite clear from this exhaustive study that no treatment of affected water or of animals drinking it is likely to be economically feasible. It seems equally clear that the only sound approach to the problem is through management, for in all cases where stock are exposed to and protected from fluorided waters, the animals are least affected when protection is afforded immediately after birth. Further, the longer the initial protection the more satisfactory the result.

Vitamins.

Vitamin studies of domestic animals and birds in Queensland have only been undertaken when the frank deficiency symptoms appear, so little is known of the vitamin status of stock or of foods peculiar to the State. During the year a co-operative study by veterinary officers on the effect of avitaminosis-A on infertility in Merino rams called for numerous assays, and a further vitamin-A study with chickens is in progress.

Edible Shrubs.

For many years practical experience of the feeding to sheep of edible shrubs of the drier inland areas has suggested that the rather attractive analytical figures were not satisfactory indices of their value. It has been possible to obtain sufficient material of wilga, mulga and kurrajong to conduct digestibility trials with sheep. The figures show what had been suspected. Not only are the energy-food groups poorly used, but the protein level, which might have been regarded as satisfactory even for lamb-rearing, is insufficient to maintain bodily functions. The work is to be continued so that all important fodder trees will eventually be so examined. In the meantime, the results which are ready for publication must appreciably alter preconceived ideas on supplementary feeding when "scrub" is plentiful.

Cereal Chemistry.

Biochemistry of plants has occupied a position subordinate to that of animals. Lack of space and shortage of staff have hampered its development. Sufficient apparatus has now been accumulated to form a modest nucleus for cereal chemistry work. The initial programme has centred round mottled wheat as part of the wider wheat-quality survey. Large numbers of wheat samples are being examined so as to provide clues to the effects of soils, varieties and climate on quality.

GENERAL ANALYSIS.

This group is the analysing authority for registered products coming under the control of the Standards Branch. Pest destroyers, veterinary medicines, stock foods and fertilizers are regularly submitted for checking with the guaranteed composition. These, and the numerous prepared sprays and dips to be tested for strength, constitute the bulk of the routine bench work, which included examination of over one thousand samples during the year.

Valuable as these services are, they do not afford the interest that the co-operative work with other Branches in the Department provides. The progressive loss of insecticides from fruit and tubers by decomposition, evaporation, penetration or mechanical means has been followed by analysis as part of control work on stored foodstuffs conducted by the Science Branch.

The estimation of the oil content of sunflower and linseed has continued and the results furnished to the Branches initiating the work.

The composition of fodders either being stored as drought insurance or used during the drought has yielded interesting results.

Mitchell grasses reach their maximum nutrient status quickly, and equally rapidly become fibrous and less nutritious. The yield per acre in terms of hay is low by all agricultural standards, and so there is a strong temptation to leave the cutting until the maximum tonnage is expected. Herein lies the fallacy revealed by analyses. It is a fairly safe assumption that most fodders should contain at least 5% protein on a dry-matter basis to meet the bodily requirements of herbivorous animals. Mitchell grass within a few weeks of commencing new growth has reached its maximum protein of about 12% and might be expected to yield up to 3 cwt. of hay per acre; in another month the tonnage may reach its harvestable maximum of about twice this figure, but its protein content is by then less than half the maximum and its digestibility greatly lowered. It is doubtful if any stored Mitchell grass hay examined to date would meet the needs of a lambing ewe, even if it were fed freely. This is not to say that it could not, with a little supplementation, do so, and there is evidence that this can be done.

Another point of interest is that the feeding value of Mitchell grass hay from the centre of well-prepared stacks of long standing is not greatly different from that of recently cut hay. This may not mean much when the amount of real food value that could be lost is small, but it may point to the way in which roughage should be stored in the arid areas where deterioration in loose stacks or bales may reduce good hay to straw value in five years.

PLANT NUTRITION.

Soil Surveys.

The great demand for services of soil chemists in connection with important developmental projects has forced the diversion of an unbalanced proportion of the staff to soil survey work.

Initially the effect of this is not serious. It merely means that laboratory investigations are temporarily curtailed. However, as the field work proceeds, the demand for analytical determinations increases enormously, and ultimately the "bottle-neck" of soil survey work will be found in the laboratory. An attempt to relieve this situation is being made by providing laboratory facilities in districts where soil surveys are proceeding; the first has been established at Ayr.

The main survey undertaken during the year was the detailed survey in the Millaroo section of the Burdekin district. Good progress was made under difficult conditions, and it was possible to supply to the Irrigation and Water Supply Commission a map delineating the boundaries of the levee types in sufficient time to enable farm planning for 1953 to proceed. The survey of the remaining portion of the area is progressing as rapidly as the staff position permits. The soil types of the flood-plain alluvials are complex and the success of this project calls for careful mapping.

Other soil surveys on which reports were submitted during the year were those of Moura, Cooyar, Inglewood, "Brian Pastures," and Clare.

Wallum Investigations.

Two areas of poor sandy soils, similar in characteristics to much of the wallum country, were selected for experimental purposes and have now been made available to the Department. One is a small area in the vicinity of Brisbane in what is known as the "Blunder" country, and the other an area of 1,930 acres of Crown land near Coolum. Portions of these areas selected for investigations will need to be cleared, fenced and drained before experiments can proceed, and it is hoped to commence these improvements in the near future.

Soil Laboratory Investigations.

Because of the large amount of field work undertaken during the year, laboratory investigations have been curtailed. Some interesting data have been accumulated and the following examples, in particular, merit investigation—certainly beyond the initial probings.

(1) It has been shown that soils in certain districts contain very low quantities of available phosphoric acid in the surface layers, but the amounts improve considerably with depth until a point (well within the root zone of many plants) is reached at which this nutrient is plentiful. Such widely spaced districts as Cape York Peninsula and Gayndah have been recorded. On some of these soils light applications of superphosphate will be required to establish crops or pasture, but on others a deep ploughing may be all that is necessary. Once established, crops or pasture should not require further applications of phosphatic fertilizers.

(2) Toxic quantities of soluble manganese are present in certain red soils, some derived from quartzites and others from sandstones. Soil analyses and leaf analyses of chlorotic plants confirm this. Such soils are strongly acid and preliminary investigations suggest that a study of their buffer curves will provide the solution to the problem by indicating the amount of lime or dolomite necessary to reduce the soluble manganese to a non-toxic level. It is hoped to continue this investigation during the coming year, as it is of particular importance to the bean crop.

Foliar Diagnosis.

During the year numerous cases of micro-nutrient deficiencies have been diagnosed successfully by members of the staff, who have been aided considerably in their work by coloured photographic transparencies. Collaboration with the field services is sought and authentic cases of trace-element deficiencies are photographed in colour. A valuable reference library is thus being gradually accumulated. In the vegetable-growing districts near Brisbane, molybdenum and boron deficiencies have been most widespread.

Forestry Work.

Fertilizer experiments with seedlings were continued at the forest nurseries and a significant response to copper and boron combined was obtained with *Pinus radiata* at Passchendaele. Molasses has been beneficial in improving the physical condition of the soil in the seedling beds at Benarkin and this has been reflected in the increased growth of the hoop pine seedlings.

In addition to the investigation work on forest nurseries, numerous soil samples have been analysed for total phosphoric acid and periodical checks are made of the changes in composition of the water at various nurseries.

Water Analysis.

The prolonged drought period in 1951 was responsible for the submission of a large number of water samples for analysis, and it was only by the use of new analytical procedures and physico-chemical methods that it was possible to cope with them; 1,664 samples were analysed.

Many interesting cases of bad-quality stock waters came during this period and sufficient data are now in hand to commence the mapping of zones for water quality.

Routine Soil Samples.

These are now limited to samples submitted by field officers of the Agriculture and Horticulture Branches, but the increasing interest of graziers and farmers in pasture improvement has been responsible for a large number of samples, the total being nearly 3,000. As with routine water tests, quick approximate methods have replaced the older more detailed and accurate ones whenever considered practicable.

VETERINARY SERVICES BRANCH.

Mr. C. R. Mulhearn, Director of Veterinary Services.

Seasonal and pastoral conditions during the year were remarkable for prolonged dry periods, poor condition of the pasture, unprecedented bush and grass fires, uneven distribution of storms and rainfall, and failure of the general monsoonal rains over a large area of Queensland.

The foregoing conditions, associated with the abrupt and early termination of the previous wet season in February 1951, were responsible for one of the worst droughts on record in some parts of the State. Beneficial rains were, however, experienced during the period February to April in the coastal and sub-coastal areas and through most of the country extending from along the Rockhampton-Longreach railway line to the southern border. A reasonably good recovery was experienced in this area and fat stock and other animal products are being marketed, but the general turn-off has been below normal.

In those areas where the monsoonal rains failed, and particularly in a large area of the north-western section of the State extending from Hughenden to Julia Creek and along the Northern Territory border, drought conditions still persist and there is little prospect of relief for many months. The strongest animals in these areas have already been moved to agistment country where pastoral conditions are more satisfactory, but the breeding stock, which comprise a large proportion of the animals remaining on the properties, are too weak to move and have little chance of surviving the dry winter period. These animals cannot readily be replaced and their loss will have an adverse effect on the turn-off from the area for several seasons. Losses have also been heavy amongst young stock, upon which the pastoral industries will be largely dependent for production during the next few years.

The failure of rivers such as the Flinders and Georgina to run and provide surface water along important stock routes has added to the difficulty of moving stock from the worst-affected areas. The stock route from Lake Nash to Urandangie, which is the principal outlet for stock from the Northern Territory and Queensland border stations to the railhead at Dajarra, and from Gulf areas to the railhead at Julia Creek, became untrafficable early in the 1952 season and alternative routes had to be used by stock which could be moved.

STOCK MOVEMENTS.

Pastoral conditions during 1950 and during the early months of 1951 were very favourable and large numbers of stock were turned off from fattening areas, while store stock were in excellent condition and stock routes were well grassed and watered until the winter of 1951. Large numbers of cattle were moved from the breeding to the fattening areas and the number of stock moving from the Northern Territory to Queensland during the autumn, winter and spring of 1951 approached record proportions. However, the unusually dry autumn and winter reacted unfavourably on general stock movements and values, and by the spring of 1951 the store-stock market was dull and stock movements showed a marked decline. The market value of fat cattle, which were in short supply as a result of the prolonged dry period, showed a marked upward trend, and prime-quality animals were in very short supply by the end of 1951.

The unfavourable seasonal conditions were also responsible for a reduced turn-off from fattening areas, with the result that the stock were held over for an additional season and the demand for replacement store cattle was very limited. This resulted in reduced stock movements during the autumn of 1952, and many of the movements that did take place were for the purpose of transferring stock from drought-stricken areas to country where feed was available rather than the normal movement of store stock from the breeding areas to restore numbers in the fattening areas.

Improved pastoral conditions in central and southern Queensland increased stock movements during the late autumn and winter of 1952, but in general stock movements during the 1951-1952 season were considerably below those of the previous year.

Details of interstate movements are given in Table 1.

TABLE 1.

TRANS-BORDER STOCK MOVEMENTS.

—	Cattle.	Sheep.	Pigs.
Entered from Northern Territory	50,464	..	..
Entered from New South Wales	36,812	247,039	1,107
Removed to Northern Territory	..	..	..
Removed to New South Wales	267,639	275,860	22,945

PEST AND DISEASE CONTROL.

The general incidence of diseases was below the average of normal years and this was largely associated with the dry conditions and restricted stock movements. Severe losses, however, were associated with outbreaks of contagious pleuro-pneumonia, tick fever, blackleg, and plant and mineral poisoning. Two unusual conditions which occurred during the year were the high incidence of scrub-tick paralysis and the heavy losses of forward dairy cows during the dry period from a sickness described as drought paralysis. Losses from poverty were very heavy and occurred in practically all districts until the advent of drought-breaking rains in coastal, central and southern Queensland, but they continued and are still occurring in the north-western areas. Mortalities from poverty due to shortage of pasture far outweighed losses from all other causes during the year. It is difficult to estimate the actual number of deaths from this cause, but on many properties it would reach 50 per cent. of the total stock and the number of losses would aggregate many thousands. In addition to actual deaths, the value of stock remaining on the properties has been greatly reduced due to loss of body condition.

Contagious Pleuro-pneumonia.

Contagious pleuro-pneumonia was again one of the most serious infectious diseases encountered, but the 23 recorded outbreaks showed a marked reduction on the 58 of the previous year. Eight of the outbreaks occurred in Northern Territory travelling cattle shortly after entering Queensland. These outbreaks were difficult to control owing to the absence of suitable agistment country on which the cattle could be quarantined. This necessitated keeping the cattle under constant observation, destroying affected animals, and moving stock to the railhead for trucking to suitable country where permanent quarantine could be enforced.

Most of the other outbreaks occurred in or originated from enzootic areas in central or north-western Queensland. The south-eastern section of the State remained relatively free from the disease, but two outbreaks were recorded in the Brisbane district and one in the Burnett district. Beef cattle only were affected and the losses varied from comparatively light on small properties where early diagnosis and control was possible to heavy in certain mobs of travelling cattle where conditions for control were unfavourable. It was necessary to destroy 74 head in one mob of 1,200. An accurate estimate of the losses due to pleuro-pneumonia on the larger properties where the disease is prevalent is difficult to obtain, but a loss of 140 head in a herd of 4,000 was reported from one property over a period of six months.

Control of this disease was discussed with representatives of the Northern Territory Administration at Camooweal before the onset of the present cattle season and agreement was reached that all cattle from the Northern Territory should be inoculated under supervision prior to entering Queensland. It was not possible

to enforce this condition during the present season owing to drought, but arrangements were made for inoculation at the first suitable opportunity after entering Queensland. Introductions from the Northern Territory during this season approximate only one-fifth of the normal number and the season is now almost completed. Only one outbreak of pleuro-pneumonia has been recorded in the cattle.

Investigations were undertaken by a veterinary officer during the year in north-western Queensland and the Northern Territory. Much valuable information was obtained and control measures are being modified in the light thereof. The benefits of vaccination, which have been questioned by some during recent years, were closely studied and it is apparent that this method of control has a definite value, but closer supervision and more attention to detail in the act of vaccinating is necessary.

More intensive surveys and inspections are being undertaken in Queensland to detect outbreaks of the disease, and co-operation is being obtained from officers at meatworks and slaughtering establishments where active cases are detected. When this work has been completed, the suspected areas will be defined and more stringent control measures will be enacted to protect the disease-free areas of the State. Extension work is also being carried out to advise owners in the suspected areas of control and preventive measures which will minimise the incidence of the disease in the country under their control.

Tuberculosis.

The Departmental tuberculosis-control scheme was continued and extended. The number of cattle included under the testing scheme increased from 100,000 to approximately 300,000 during the year, while the actual number of tests carried out increased from 86,360 to 160,264. Additional veterinary surgeons who will undertake tuberculin testing on behalf of the Department commenced practice at Oakey, Dalby, Gympie. (2), Bundaberg, Townsville, and Atherton. Twenty-two approved veterinary surgeons are now carrying out tuberculin testing, under the control of the Department, in most of the principal dairying districts, while Departmental officers are serving areas where practitioners are not established.

Herds supplying either milk or cream are being tested in the Brisbane, Darling Downs, Kingaroy, Gympie and Bundaberg districts, while herds supplying wholemilk to most of the principal cities are subject to test.

Particulars of testing are shown in Table 2.

TABLE 2.

CATTLE TESTED FOR TUBERCULOSIS IN 1951–52.

District.	Number of Herds.	Number of Tests.	Number of Reactors.	Percentage of Reactors.
Southport ..	104	7,153	26	·36
Coomera	62	4,524	46	1·02
Beenleigh ..	85	3,102	66	2·13
North Brisbane ..	35	1,999	20	1·0
Beaudesert ..	107	9,233	57	·62
Beaudesert–Border	67	6,240	21	·34
Armstrong Creek–Dayboro' ..	37	2,711	21	·77
Dayboro'–Mt. Mee	47	3,483	24	·69
Kilcoy	49	4,473	35	·78
Caboolture ..	21	2,292	25	1·09
Maleny	20	1,497	12	·80
Ipswich	254	11,700	36	·31
Maclean – Jimboomba ..	40	2,119	22	1·04
Total for Brisbane Area ..	928	60,526	411	·68
Rockhampton ..	227	16,006	186	1·16
Maryborough ..	804	52,302	653	1·25
Toowoomba ..	655	26,830	114	·42
Atherton	75	4,600	19	·04
Total	1,761	99,738	972	·97
Grand Total ..	2,689	160,264	1,383	·86

The incidence of tuberculosis in milk herds in south-eastern Queensland area which have been subjected to regular testing over a number of years has been reduced from 11.86 per cent. in 1947 to 0.64 per cent in 1951-52 (see Fig. 1), while the general incidence in all herds tested throughout the State is also very satisfactory, being less than 1 per cent. Individual herds with a high percentage of reactors are still occasionally encountered in areas where tests are being carried out for the first time.

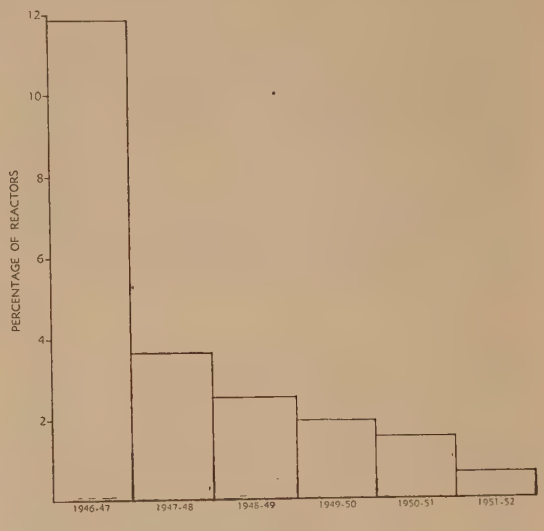


Fig. 1.

GRAPH SHOWING THE REDUCTION IN THE INCIDENCE OF TUBERCULOSIS IN CATTLE SUPPLYING MILK IN THE SOUTH-EASTERN QUEENSLAND AREA BETWEEN 1946 AND 1952.

Tuberculosis control in suspected beef cattle herds was extended during the year, when stud and breeding cattle were tested on three properties in North Queensland. A relatively high incidence of tuberculosis has been recorded in cattle at slaughter-yards and meatworks from certain properties in this area.

The tuberculosis-free-herd scheme is being continued and extended and seven new herds were tested, making 41 herds now listed under this scheme.

Tick Fever.

Serious outbreaks of tick fever in travelling cattle were recorded during the year. Several mobs of cattle from lightly infested country which had to travel through more heavily infested areas for marketing and other reasons were involved. Losses of up to 50 head in individual mobs were recorded. In most cases, no facilities were available for treatment and spelling was the only control measure that could be put into effect, but on a few occasions special bush yards were constructed and affected animals drafted off and passed through the yards for treatment with tick-fever specifics. In such cases, the effort involved in building the yards was amply repaid by recovered animals.

One serious outbreak was also recorded following the movement of cattle from a marginal area in the Northern Territory to more heavily infested country north of Hughenden. Sporadic cases with a limited number of losses have occurred regularly in all dairying country within the tick-infested area.

Owing to drought conditions, a large number of cattle were moved from lightly infested western areas to ticky areas on the coast, and many were inoculated as a preventive measure under the supervision of Departmental officers. Very few losses have been recorded.

Blackleg in Cattle and Sheep.

The serious outbreaks of blackleg in cattle reported during the autumn and winter of 1951 continued on into the spring and were responsible for further heavy losses among young stock. These were reported to amount to 1,000 to 2,000 head of cattle during the last two years in individual districts such as Rockhampton and Mackay. The disease gradually receded during the spring and by early summer it had almost disappeared,

Only a very limited number of outbreaks occurred during 1952 and they were of little economic importance. Isolated outbreaks occurred in sheep in the Roma and Longreach districts.

Losses were accentuated by the failure of recognised commercial vaccines to afford adequate protection, and special action was taken to obtain specimens from field outbreaks so that strains of the organism that was actually producing the disease could be incorporated in a vaccine being prepared by Commonwealth authorities. This vaccine was subsequently distributed to stock-owners under supervision to obtain information on its preventive value. Several properties on which the vaccine was used were kept under observation and subsequent outbreaks of blackleg coming under notice have been closely investigated. The incidence of the disease during the past six months, however, has been so low that little information on the value of the vaccine could be obtained.

Arrangements were also made for the importation of an overseas vaccine while the Commonwealth product was being prepared, but by the time this product was available, the occurrence of blackleg was rapidly diminishing.

Bovine Brucellosis.

Strain 19 inoculation to develop herd immunity is the form of bovine brucellosis control practised in most districts. The programme of inoculation was restricted during the year due to the difficulty of mustering and handling calves during the dry period. Strain 19 work is now divided between Departmental officers (who inoculated approximately 20,000 calves) and practising veterinary surgeons. Results from this project continue to be satisfactory and very few abortions or sterility problems are reported from herds in which inoculations have been regularly carried out.

A limited amount of brucellosis testing of adult stock was carried out in connection with sterility investigations and for culling purposes.

A number of herds supplying milk for human consumption are being tested in areas where undulant fever has been diagnosed in humans. Arrangements are being made to dispose of any positive reactors that may be detected.

Porcine Brucellosis.

A considerable amount of porcine-brucellosis-control work was undertaken in connection with the accredited-herd scheme. A limited number of positive animals were detected, and it is evident that the disease is not prevalent in Queensland herds, though occasional outbreaks of sterility suspected of being due to porcine brucellosis are encountered.

The response to the brucellosis testing scheme has been satisfactory. Herds now listed as having fulfilled the requirements total 62.

Trichomoniasis.

One herd in which trichomoniasis was diagnosed in 1950 is still being held under quarantine restrictions, as an active case of the disease was detected at slaughter in an animal which failed to breed. The breeding history of the remaining animals in the herd is now satisfactory.

Drought Paralysis.

An unusual disease complex was responsible for heavy losses in breeding cattle during the last quarter of 1951, when drought conditions were prevailing in most of the dairying districts.

Dairy cows which were forward in calf formed a large proportion of the affected animals. These animals, many of which were in reasonably good condition, developed muscular inco-ordination and became recumbent and developed a type of paralysis. A limited number responded to hand-feeding and careful nursing, but most failed to respond to the usual treatments for mineral imbalance and died after being cast for several days.

The condition was most prevalent in the Brisbane, Gympie and Rockhampton districts.

Leptospirosis.

This disease was not so common as during recent years, but it was diagnosed or suspected in most of the dairying districts in southern Queensland. One outbreak was also reported from Mackay. Losses were not severe and were chiefly confined to calves.

External Parasites.

Cattle Tick.—Cattle-tick infestations varied considerably throughout the year and they were affected to a large extent by seasonal conditions. The infestations gradually built up during the dry period in the spring and became heavy towards the middle of the summer. They were accentuated by difficulty in mustering and travelling cattle to dipping centres.

The dry conditions caused poverty-stricken cattle, which appear more susceptible to infestation, to congregate in large numbers on the limited feed and around watering places, and this caused a general increase in the degree of infestation. With the advent of substantial rains in January, there was a pronounced decrease in the infestation, particularly in coastal districts, and it is considered that this was due to dispersal of the stock from heavily infested areas.

Heavy infestations persisted in the drought-stricken country, and contrary to the expectation that ticks would disappear from the area that became infested on the Queensland-Northern Territory border between Camooweal and Urandangie during 1950, it was ascertained that the infestations persisted and in some areas were quite heavy. Stock concentrations, scattered light rains and the absence of dipping facilities may have been associated with the persistence of the ticks in these areas.

The insecticides DDT and BHC are now widely used by stock-owners for cattle-tick control, but arsenic is still used extensively, even though reports that effective control cannot be maintained with this substance are still forthcoming.

There is no evidence that DDT is losing its efficacy as a tickicide in dips properly charged and maintained. Some dips have been charged with a DDT preparation continuously since 1946 and are still giving excellent control.

BHC in various forms was used in a large number of dips with good results, but in the opinion of some members of the staff in Central Queensland, the control obtained was not so satisfactory as during previous years, particularly during the period when infestations were heavy.

Although the effectiveness of the newer insecticides is generally recognised by stock-owners, the control of cattle tick on some of the larger properties is far from satisfactory. This is due in nearly all cases to failure to dip cattle often enough during the period when tick infestation is heaviest, and in most cases this can be corrected only by the construction of more dips and more frequent handling of the cattle.

In coastal and sub-coastal areas, tick infestation caused heavy losses towards the end of the dry season, when cattle were too weak to be moved long distances to dip. On some properties in the north-west, where heavy tick infestation is seen at certain times of the year, there are no facilities for treatment.

Since 1947, a number of dips have been charged by the Department with new insecticides, principally DDT preparations, both on the fringe of the tick-infested area and at stragetic points on the principal stock routes. The object of this scheme is to reduce infestation in buffer areas and to minimise the risk of spread of ticks to clean country. At the same time, of course, many of the dips in question serve the additional purpose of helping to control the spread of buffalo fly. This project has been successful, for ticks have been eradicated from a limited area in marginal country in the South Burnett district and there have been no outbreaks of ticks in clean country due to the movement of cattle cleansed in DDT dips. The provision of such dips on the stock routes has greatly reduced the degree of tick infestation in travelling cattle.

These activities were continued and extended during the current year, when nine additional dips were taken over and maintained by the Department. A total of 52 Departmentally controlled dips is now included in this scheme.

The utilisation of new dips at Yelvertoft and Headingly, on the principal stock routes leading from the north-western infested border areas, greatly assisted the cleansing and uninterrupted movement of cattle from this drought-stricken country. It would not have been possible to maintain effective tick control and move the cattle if these dips had not been available.

Details of dippings in DDT are given in Table 3.

TABLE 3.

STOCK TREATED IN DDT DIPS IN 1951–52.

Number of dips charged	47
Cattle dipped	447,072
Horses dipped	5,398

Scrub Tick (*Ixodes holocyclus*).—Unusually heavy infestations with scrub ticks in farm animals were reported during the spring and autumn. The scrub tick is quite distinct from the cattle tick and it affects animals by the injection of a venom which causes paralysis and death. As a general rule, only smaller-type and young farm animals are affected and then only in limited numbers, but during the past season heavy losses were experienced even in well-developed steers.

The scrub tick is only found in coastal and sub-coastal areas and it is largely confined to scrubby country. It was very prevalent in the Brisbane and Mary Valleys and on the Atherton Tableland during the year. The dry seasonal conditions apparently favoured tick propagation and stock were inclined to wander further into scrub in search of edible plants and consequently became exposed to heavier infestations.

Beef and dairy cattle and pigs were chiefly affected. Losses of up to 20 per cent. of the young stock occurred on some dairy-farms. Some relief on such properties was obtained by regular treatment with DDT preparations.

Buffalo Fly (*Siphona exigua*).—During the autumn of 1951, the buffalo fly extended to and became established in areas as far south as Roma and Chinchilla on the Western line and Gympie on the coast. This parasite requires a mild climate with warmth and moisture for its propagation, and it is unable to with stand prolonged dry periods or low temperatures.

The winter of 1951 proved to be very dry, and severe frosts were experienced; these conditions resulted in the disappearance of the buffalo fly from a large portion of the infested area. The parasite failed to reappear in the Roma district in the spring and summer, and it also died back on the coast to the vicinity of Gladstone. Light infestations were recorded in the Rockhampton and Emerald districts during the summer months; this was the most southerly area in which the fly reached pest proportions during the year.

The general infestation throughout the recognised buffalo-fly area has been below normal and no difficulty in control is being experienced. The use of DDT both by local application and in dips for general parasitic control is proving satisfactory in minimising the effects of the parasite.

Advantage was taken of the adverse seasonal conditions and partial eradication of the parasite to move the rail and road control plants from the Gympie and Gayndah districts to Rosedale and Monto, a distance of approximately 150 miles. Control measures were continued at these centres, but general seasonal conditions were unsatisfactory and the fly failed to become established in either centre. The contraction of the fly-infested area northwards and its control at the above centres have given relief from the parasite in the cattle area along the coast and in the Upper and Central Burnett districts.

Internal Parasites.

Although seasonal conditions during the past 12 months have been adverse for the development of heavy infestation with internal parasites, cases of clinical internal parasitism have been reported in calves from most coastal districts. Phenothiazine, which is now in better supply, is again being extensively used for parasite control, with satisfactory results. A heavy mortality in sheep in the Prairie district during the summer months was considered to be due to haemonchosis (stomach worms).

Poisoning.

Plants.—Deaths from plant poisoning were greater than those experienced during a normal season and were one of the principal sources of loss to stock industries during the past year.

Factors associated with increase in plant poisoning included the shortage of natural feed during the dry period, the movement of stock to relief pastures, and unusual climatic conditions.

One of the most serious losses occurred in the Quilpie district, where 80 bullocks died over a period of four days from suspected Ellangowan poison bush poisoning. Noogoora burr poisoning occurred in several districts following the rapid appearance of seedlings after the first drought-breaking rains.

Prussic acid poisoning was responsible for serious losses of dairy cattle in the Brisbane and Maryborough districts following grazing on regrowth of wilted sorghum. Some spectacular recoveries from this type of poisoning resulted from prompt treatment of affected animals with sodium thiosulphite (hypo) by members of the field staff.

Georgina River disease caused serious losses in both sheep and cattle in north-western Queensland. This disease now is suspected to be caused by ingestion of leaves and pods of the gidyea tree.

Black bean or Moreton Bay chestnut poisoning was reported from centres from Gympie to Rockhampton. This plant appears to be responsible for poisoning only in times of drought, when natural pastures are depleted.

Wallum disease, in which zamia palm is suspected of playing a part, occurred in animals moved on to the coastal wallum country during the drought period. Paspalum ergot poisoning occurred during the autumn months in country extending from the southern border to Gympie. This disease, while not causing many deaths, seriously interferes with production in dairy areas at a time of the year when pastures are in good condition and stock-owners expect maximum returns.

Losses due to lantana poisoning occurred in several centres between Brisbane and the Atherton Tableland.

Deaths following the ingestion of plants rich in oxalic acid, such as pigweed, roly-poly and soda bush, occurred in travelling stock, both sheep and cattle. Numerous other plants—including poison peach, wild cotton, bracken fern, mintweed, tie-bush, woolly water-lily and green cestrum—were also responsible for deaths.

Minerals.—Most deaths from mineral poisoning are directly attributable to arsenic. Deaths of cattle as the consequence of dipping in an arsenical solution came under notice on only one occasion, but numerous deaths due to ingestion of arsenic were reported and confirmed. The sources of arsenic in thee cases were dip refuse, discarded arsenic containers and arsenic-sprayed pastures. Arsenic appears to be readily taken by cattle.

A number of deaths from lead poisoning were recorded and confirmed, the source in most cases being discarded wet-cell batteries.

Outbreaks of nitrite poisoning were recorded in pigs.

Benzene Hexachloride (BHC).—A number of deaths suspected of being due to BHC poisoning following dipping or spraying were investigated in the Ipswich, Burnett and Rockhampton districts. Calves mainly were affected, but some deaths occurred in adult cattle. Most losses occurred during the hot, dry period of the year when stock in poor condition were dipped during the heat of the day. No further cases of this poisoning have been reported since the advent of useful rains in February.

Diseases of Horses.

Horses are particularly free from infectious diseases in Queensland, and apart from those due to strangles deaths were mainly due to ingestion of poisonous plants. Outbreak of strangles were reported from the Darling Downs, but they were most prevalent in North Queensland, where serious interference with mustering resulted in the Townsville and Hughenden districts.

Birdsville disease, due to ingestion of the plant *Indigofera enneaphylla,* was reported from most western districts and caused serious mortalities in the Dajarra, Cloncurry and Kajabbi areas. Heavy losses in horses suspected of being due to walkabout disease were reported from properties in the Charters Towers and Normanton districts. A botanical survey was carried out in the former area.

Losses due to coastal staggers (*Gomphrena celosioides*) poisoning and Tallebudgera horse disease (*Eupatorium adenophorum* poisoning?) were much lighter than normal during the year. Oesophageal disease (*Crotalaria* poisoning) was reported from both North Queensland and Rockhampton areas, where it caused some losses.

Diseases of Pigs.

Routine diseases of pigs were regularly reported from all pig-raising districts. Most losses resulted from outbreaks of swine pneumonia, necrotic enteritis and Glasser's disease. Effective control in the last disease was obtained with sulphonamide therapy.

Swine erysipelas occurred in the Maryborough and Brisbane districts. Other important pig diseases included avitaminosis and infestation with both internal and external parasites.

Diseases of Poultry.

Poultry diseases encountered during the year included leucosis, salmonellosis, coryza, roundworm infestation, cholera, fowlpox, "black comb," coccidiosis, avitaminosis and botulism.

The incidence of coccidiosis, one of the most common diseases, has been rather lower than usual and the outbreaks less severe in their effects. This has been possibly due to the long dry spell in the spring and summer, but avitaminosis was correspondingly increased. Botulism was most prevalent in the North Queensland area.

EXTENSION SERVICES.

The appointment of additional veterinary and other field officers made possible a more complete extension service to stock-owners. This aspect of veterinary activities was also discussed at a Divisional Veterinary Officers' conference held in Brisbane during May, and these officers are regularly visiting all districts within their divisions, contacting field officers and stock-owners and disseminating information on control and prevention of disease.

Demonstrations and field days have been carried out in most districts, but officers were handicapped in their activities during the first half of the year due to adverse seasonal conditions.

BRANDS.

Details of Registrations, Transfers, &c., for 1951-52.

—	Number for Year.	Number since Inception of Legislation.
Ordinary Three-piece Horse and Cattle Brands Registered	..	92,242
Cancelled Horse and Cattle Brands Registered	848	14,087
Horse and Cattle Symbol Brands Registered	89	2,650
Horse and Cattle Brands Transferred	1,706	78,945
Cattle Earmarks Registered	648	35,337
Sheep Brands and Earmarks Registered	197	14,007
Sheep Brands and Earmarks Transferred	234	9,085
Distinctive Brands Registered	5	1,327
Alterations of Address of Brands	210	..
Brands Cancelled	26	..
Earmarks Cancelled	156	..

There was a considerable decrease in the numbers of registrations and transfers as compared with the previous year, which was a record. However, taking into consideration the drought which affected the pastoral industries generally, the figures are comparable with those of previous years. Registrations declined during the first few months and reached a low level during the middle of the year, but returned to normal level during the last three months.

The Horse and Cattle Brands Directory is being amended and the revised copy complete to the end of 1952 will be available for printing early in 1953. Copies of the Sheep Brands Directory completed to the end of 1951 are now available.

Stock-owners generally appear to be observing the requirements of the Brands Acts, as few cases of irregular branding and earmarking have been reported. Carelessness in application is the main cause, and offenders have been advised of the correct procedure to adopt in branding and marking their stock.

MEAT INSPECTION SERVICE.

Slaughterhouses.—Supervision of licensed slaughtering premises has been maintained and inspections and reports in connection with applications for renewal and transfer of licenses and the granting of new licenses have been carried out. Where premises have not been considered satisfactory, licenses have been withheld until the required work is carried out.

New slaughteryards have been erected and licensed at Townsville, Wondai and Miles, and others are in the process of erection at Bribie and Woodridge. At Beaudesert, a modern slaughtering establishment was licensed under the *Slaughtering Act* and commenced operations in May. It has a slaughtering capacity of 500 head of cattle, 250 pigs and 500 calves per week. Chilling and freezing accommodation are provided.

Butcher Shops and Vehicles.—Inspections of butcher shops and vehicles have been maintained. New shops have been approved at Cairns, Miles, Amity Point and Dunwich. The use of modern building materials, particularly in the Brisbane area, has led to a very high standard of shop construction. Increasing numbers of refrigerated show-cases are being installed and stainless steel is proving very valuable for fittings. Many new large hanging waggons costing up to £2,000 each have been put into operation in the Brisbane area.

Meat Inspection.—The standard of meat inspection is satisfactory at centralised killing establishments. In country areas, planning and co-ordination of inspection services to get the maximum efficiency under the difficult conditions of scattered slaughteryards and shops are necessary. The decreasing availability of meat points to the eventual use of more critical methods of meat inspection in order to salvage as much healthy meat as possible. The staff has co-operated in investigations on tubercle-like lesions in pigs, carried out by the Animal Health Stations Branch. These lesions at present necessitate the condemnation of meat in which they are present for the reason that naked-eye differentiation between them and lesions of tuberculosis is uncertain.

Information on slaughterings for local consumption are given in Table 4.

TABLE 4.

TOTAL NUMBERS OF STOCK SLAUGHTERED FOR LOCAL CONSUMPTION.

—	Bullocks.	Cows.	Calves.	Sheep.	Swine.
Bacon Factories	14,026	27,124	19,671	2,712	219,276
City of Brisbane (Abattoir)	113,369	126,948	176,258	382,637	84,695
Larger Population Centres	76,806	58,412	34,494	141,666	29,197
Country Centres	38,890	32,424	32,708	37,352	18,047
Totals	243,091	244,908	263,131	564,367	351,215

Grading.—Grading of beef and mutton is carried out only at the Brisbane Abattoir. Observations are being made on the age characteristics of carcases for use in grading and for the protection of the consumer. No system of grading pig meats is in operation for the local trade. A survey of pigs slaughtered at bacon factories is being undertaken to secure information on this matter.

Canned Meats.—Specifications are being drawn up to cover the preparation of canned meats for the local market.

Horse Slaughteryards.—Slaughtering of horses is carried out under strict supervision at Bromelton, Bunya, Maryborough, Townsville and Cape River. From the last-named works horse meat is exported overseas. The disposal of horse flesh is constantly checked to prevent malpractice. Tests have been developed at Yeerongpilly Animal Health Station which enable horse flesh to be detected in small goods. The control of deliveries, boning of carcases at yards, and mincing of meats might be the subject of further regulations.

Disease Control.—The staff has co-operated with officers of other branches in tracing infectious diseases, particularly tuberculosis and contagious pleuro-pneumonia. There is much scope, with improved facilities, for an extension of this co-operation, particularly in the field of pig diseases. All cattle tuberculin reactors consigned to the special slaughteryard at Goodna were slaughtered under supervision, and all carcases, tankage, etc., certified to have been delivered to the abattoirs for conversion into fertilizer.

BREACHES OF ACTS.

Breaches of the Acts administered by the Veterinary Services Branch were recorded, and it was necessary on a number of occasions to recommend prosecutions to obtain observance of the Acts. Minor breaches can usually be corrected by a warning to the offender, but all of the 14 prosecutions (8 under the *Diseases in Stock Acts* and 6 under the *Slaughtering Act*) for major or repeated breaches were successful. Breaches under the *Diseases in Stock Acts* were chiefly for failure to obtain a permit and/or complete a waybill in connection with stock movements; and those under the *Slaughtering Act* for illegal slaughter.

There were no prosecutions under the *Brands Acts*.

ANIMAL HEALTH STATIONS.

Dr. J. Legg, Director of Research.

This report covers the activities of the animal Health Stations at Yeerongpilly and Oonoonba.

LABORATORY.

Accommodation in the laboratory at Yeerongpilly is limited and it has been difficult because of the shortage of material to get essential alterations made.

Outside accommodation at Yeerongpilly is also very limited now in view of the greatly increased numbers of animals offering. A good deal of land has been alienated to other bodies during the last few years, the City Council having taken over more than one-third of the property, while the University commenced building some years ago and has continued to add to its requirements at the expense of the Station's grounds. Under pre-war circumstances this encroachment would have been bad enough, but under conditions obtaining at present it is a very serious matter, more especially where paddock and yard accommodation for the larger animals is concerned.

The number of specimens handled by the two stations is set out in Table 1.

TABLE 1.

Summary of Specimens Examined.

	Yeerongpilly.	Oonoonba.
Number of batches of specimens	2,350	547
Complement fixation tests for contagious bovine pleuro-pneumonia	175	..
Brucellosis agglutination tests—		
Bovine	4,203	341
Porcine	1,713	30
Milk samples, bovine mastitis ..	372	28
Autopsies—		
Fowls	1,062	83
Ducks	29	14
Pigs	59	15
Sheep	65	15
Cattle	38	9
Horses	4	1
Goats	..	59
Dogs and cats	10	16
Other animals	20	4

Vaccines supplied are shown in Table 2.

TABLE 2.

Vaccines Supplied.

	Yeerongpilly.	Oonoonba.
Contagious pleuro-pneumonia (doses)	130,200	215,500
Infectious labial dermatitis (doses)	217,500	..
Brucella abortus Strain 19 (number of calves inoculated)	23,849	..
Tick fever blood (doses) ..	12,358	9,382

DISEASES AND PARASITES OF CATTLE.

Tick Fever.—Bleeders for the immunising of cattle were in limited demand because of the dry conditions prevailing during the first half of the period under review. During the year 111 were despatched from Yeerongpilly and 7 from Oonoonba.

Table 3 shows the number of bleeders sold and stud cattle immunised at Yeerongpilly since 1944-45.

TABLE 3.

Tick Fever Immunisation (Yeerongpilly).

Year.	Bleeders Sold.	Stud Cattle Immunised.
1944–45	53	216
1945–46	73	190
1946–47	76	170
1947–48	134	187
1948–49	110	312
1949–50	156	467
1950–51	214	569
1951–52	111	364

The large number of cattle requiring attention in recent years has contributed in no small measure to the accommodation problem mentioned earlier. The work is as a result made difficult, especially during inclement weather.

Generally, it can be said that the results of vaccination of all cattle have been satisfactory and there has been no single instance of the resistance of the animal being broken by natural infection with the causal organisms of tick fever. Some severe reactions have been recorded and drug treatment has had to be repeated to check the severity of the reactions.

Recently three animals showing a mild reaction collapsed and died after treatment with one of the well-known specific drugs. This occurrence has been noted before on rare occasions and it has been recorded also in the literature. It is a happening confined to the relatively less severe type of case and one probably that may have recovered without intervention. In these cases the animal collapses and dies within a few hours of treatment. No satisfactory explanation has been found for these cases, but it certainly complicates the routine procedure adopted as standard practice and could easily bring drug treatment into jeopardy. Fortunately, these cases occur only on rare occasions.

Anaplasmosis was recorded from the Kingaroy district in dairy cattle that had recently been inoculated. It would appear the donor animal had acquired the infection and passed this on to those inoculated.

Tick Control.—Spraying trials were continued during the year. Some herds have now completed three years of treatment and observation. Both toxaphene and chlordane have given very satisfactory results in dairy herds when used with a power spray. The power-spray method of treatment for dairy cattle has the advantage that the medicaments can be used in a freshly prepared state each time treatment is required. Limited trials with dieldrin indicate that this insecticide is also quite satisfactory. It is considered that much more of this work should be undertaken so that a mass of evidence could be provided as a basis for recommendations on the use of these various preparations. No spraying trials extending over a number of years have ever been carried out in dairy herds with either BHC or DDT, the two most commonly used insecticides, to study the reaction of the tick. Long-term observations on these insecticides have so far been confined to their use in dips.

In dipping trials BHC has been now used (in one case in dairy cattle) for over three years. It is worth recording that this dairy herd required only two treatments for the year ending April 1952, although it was a badly infested herd three years ago when work was first undertaken. The low incidence of ticks on the property can be set down to the previous treatments, plus the dry winter of 1951, which together almost exterminated the parasite on the property concerned.

Four dipping vats are now charged with toxaphene and observations have been carried out for over two years in one of them and over a year in another. In both cases satisfactory control of the tick has been obtained. One vat is situated in North Queensland on the coast, where the buffalo fly is particularly bad in a heavy wet season; the toxaphene treatment is perhaps not so good as DDT for the destruction of this parasite.

It is regretted that more observations on tick control, using dipping vats and beef cattle, are not being carried out in the field. No really extensive observations have yet been made with DDT on the control of the tick in beef herds and covering various types of seasonal conditions.

In the previous year's report reference was made to the use of a biological assay method for testing the tickicidal qualities of dipping fluids from vats under observation. This method cannot be applied as a universal test, but very valuable results have been obtained. In some cases the results of the test cannot be correlated with the chemical analyses and this is a matter that awaits further investigation.

In view of the absence of specific information on the residual effect of the various preparations now being used, some experiments dealing with this have been started. These have already produced some interesting results and will be continued.

In the last report mention was made of "fogging" trials using high concentrations of insecticides—in this case DDT mixed with BHC—and these have been continued. Some useful information has been obtained, but the work requires large-scale equipment and numerous animals, and it is not possible to pursue it with the facilities now available. The results, however, warrant further work along previous lines.

So far there is no strong evidence in Australia that the cattle tick has become resistant to any of the synthetic insecticides used in experimental work or field control, although there is of course much field evidence supporting the view that in many places ticks have acquired a resistance to arsenic. Recent work in South Africa has shown that cattle ticks—in this case the "blue" tick, which is similar in its life history and habits to the Australian cattle tick—is now in places highly resistant to BHC treatment. These ticks were found years ago to be resistant to arsenic, and treatment was switched to BHC. At first control was effective with a fluid containing 50 p.p.m. of gamma isomer BHC, but in recent years a resistance to this drug has been quickly acquired, and now up to 1,000 p.p.m. of the gamma isomer is necessary to yield the same results previously obtained with 50 p.p.m. The position was not improved by the finding that these ticks had not lost their resistance to arsenic when put under test, although arsenic had not been used for some years on the farms involved; in other words, the tick now possesses a strong resistance to both BHC and arsenic.

During the year a number of deaths occurred in cattle following treatment with BHC dipping fluids. They occurred mostly during the early 1951-52 summer, when the cattle were in low condition, so poverty and the hot weather were perhaps aggravating factors. But as all previous experience had indicated that there was a fairly wide margin of safety with BHC, poverty and hot weather could not be held wholly to blame for the occurrence. The symptoms shown by the cattle indicated that the toxic agent was probably the gamma isomer in the fluid. In one case mortality followed the use of a mixture of DDT and BHC. The amount of BHC present was considerably lower than is used in fluids made up of BHC alone. Some evidence came to hand that one of these preparations was also causing deaths in cattle in an overseas country.

Taking these various facts together, the position calls for further work on these insecticides, particularly on their formulation for use in the field. Recent work in England has indicated that in the micro-crystalline form both DDT and BHC are more effective in parasite control, and this suggests at least one line of investigation.

When it is remembered that, apart from droughts, which are difficut to control, the tick is the most serious limiting factor to production in the beef cattle districts of this State, the urgency of further work on tick control in a world hungry for animal protein needs no stressing.

Blackleg (*Clostridium chauvoei infection*).—The number of blackleg outbreaks decreased during the second half of 1951 and the first half of 1952. The epizootic that caused heavy losses in the previous year appears to have passed.

Leptospirosis (*Leptospira pomona infection*).—The number of specimens, mainly bovine sera, for examination increased greatly during 1951-52, but the number of outbreaks was not large. This was probably due to the drought, since leptospira are readily killed when exposed to dry conditions, and consequently the chances of animals being infected are much less.

Trichomoniasis (*Trichomonas foetus infection*).—No further outbreaks of this disease have come under notice, so there is still only one herd in Queensland in which this protozoan infection has been found. In this herd two cows were still empty in spite of repeated natural service followed by artificial insemination on three occasions. They were slaughtered and the reproductive organs were secured for laboratory examinations. Both showed a mild endometritis due to infection with trichomonads; that is, infection persisted in these two cows and caused them to be infertile for over 18 months.

Vibriosis (*Vibrio fetus infection*).—In a herd at Oxenford, vibriosis caused abortion in heifers vaccinated with Strain 19, while brucellosis was causing abortion at the same time in unvaccinated cows. In another herd at Beaudesert, some abortions due to vibriosis occurred; more important, however, was the fact that a dozen cows had remained empty for over a year and abattoir specimens from two of them showed that this was due to mild metritis associated with *Vibrio fetus* infection. The organism was also isolated from an aborted foetus from the Maryborough district.

Worm Parasites.—Observations on the seasonal fluctuation in the worm burden of dairy calves on the Darling Downs have been continued in association with C.S.I.R.O. Veterinary Parasitology Laboratory. Studies to date indicate that conditions on the Darling Downs are not suitable for *Haemonchus contortus* infestation in cattle. Faecal egg counts of this species rarely rise above 50 e.p.g. The large bowel worm (*Bosicola radiatus*) is much more common and probably the chief pathogen of the late autumn and winter. The two skin-penetrating species, *Strongyloides papillosus* and *Bunostomum phlebotomum* (hookworm), are apparently absent from the herd under observation. Both these species occur in every calf, at some time of its life, on coastal dairy farms. The prolonged drought greatly reduced the larval intake of cattle everywhere.

Wallum Disease.—Wallum disease of cattle acquires its name from what is known as the wallum country, which is represented by tracts of very poor soils, characterised among other things by deficiencies of minerals, especially phosphorus, and found in the coastal areas of south-eastern Queensland. One particularly large area is found in the Gympie-Maryborough district.

Cattle are not pastured there to any extent except during periods of drought. Zamia palms (*Macrozamia* spp.) grow within the area and it is known that cattle eat the fronds and as a result show the symptoms as recorded by Edwards in Western Australia in 1894 and by Stewart in New South Wales in 1899. But it is believed by local farmers that besides zamia poisoning there is another condition, which they describe as "wamps", also seen in cattle pastured on the wallum. During the 1951 drought it was expected that cases of "wamps" would occur, but although enquiry was made at various times, only one case was seen. This animal, a 4-year-old cow, showed a marked tendency to turn rapidly to the left, then lose balance and fall heavily. At autopsy there were no visible lesions except that the bones were light and brittle. The blood-phosphate level was low, as was anticipated.

Feeding experiments using young bovines were carried out with the following results. Severe liver damage was induced in two steers, each of which died after eating 3¾ lb. of *Macrozamia paulo-gulielmi*. The syndrome seen in these animals had not been recorded from the field.

Another animal was fed a mixture of *M. spiralis* and *M. douglasi* at the rate of 10 oz. per day for 30 days and developed the characteristic zamia poisoning syndrome seen in the area (and described by Edwards and Stewart).

More work is required on this subject. It is important to determine the toxic properties of these various species of *Macrozamia* and to ascertain whether "wamps" is a definite clinical entity or merely another manifestation of zamia poisoning.

Georgina River Disease.—This is included here under cattle although it involves two species of domestic animals, namely cattle and sheep, and so far as is known no others. It is called Georgina River disease, which is appropriate for the time being, because it does not occur outside the watershed of this western river. Early work on this problem, which has all the features of a plant poisoning, drew attention to the possibility of one of the fuchsias (*Eremophila latrobei*) being involved, and feeding experiments tended to support this view. However, although this plant was found to produce symptoms and lesions not unlike those seen in the natural disease, field evidence did not support the view that all the deaths could be ascribed to this plant. An experiment carried out last year confirmed this view. An area of country (about half a square mile) in a notorious centre, was completely cleared of this plant and sheep placed on it. Heavy mortality occurred with all the classical signs of the disease. At the same time attention was drawn to another species of plant, parts of which were being consumed by the sheep, and further experiments were immediately set up and continued both on the spot and at the laboratory at Oonoonba. Now, as a result, much further evidence on the causal agent responsible has been procured and more work will be carried out in the coming year along this new line of investigation.

Copper Deficiency.—Unthriftiness, scouring or death due to copper deficiency was identified in 10 further herds, the diagnosis being confirmed in all instances by liver or blood analyses done by the Chemical Laboratory.

The condition can be corrected and prevented by providing additional copper by any one of several methods, namely drenching once a week, adding copper sulphate to drinking water, supplementary feeding, or topdressing pastures. However, there are many affected sheep, beef cattle and dairy cattle in Queensland to which none of these methods can be conveniently applied.

Studies have therefore been done in collaboration with the Chemical Laboratory on methods of providing in a single injection sufficient copper to meet the animals' needs for three months. It has been found that when a single dose of copper compound is given by mouth only about 10% is retained in the body, whereas when a single dose is injected about 90% is retained. However, most of the copper compounds that have been tried cause too much damage to the tissues when injected, but a few appear promising and are being studied further.

In the course of this work it was necessary to obtain repeated samples of liver from live sheep in order to determine by chemical analysis how much copper the animal had stored in its body. This procedure (liver biopsy) is now being used on both sheep and cattle and is proving particularly valuable for experimental work and for observing the copper status of cattle grazing pastures of variable copper content.

DISEASES OF SHEEP.

Epididymitis of Rams.—The relationship of genital abnormalities to infertility in western Queensland was studied by R. M. Gunn and his co-workers in 1942. Of 6,420 rams examined by them, 9.6% were clinically affected. More than half of these cases showed epididymitis. Further, a survey by officers of the Sheep and Wool Branch in 1947 indicated that 70% of a number of infertile rams had epididymitis.

In the previous year's report it was stated that an organism had been recovered from natural cases examined at Yeerongpilly. This organism has now been identified as belonging to the Brucella group, a circumstance which is not surprising when it is considered that other members of this group show a predilection for the organs associated with reproduction of other domestic animals (for example, cattle, pigs and goats).

The disease has been reproduced by inoculating cultures of the organism into experimental rams. The artificially induced condition is comparable with the natural disease. At present one line of investigation is directed towards determining the method of transmission and another towards developing a serological technique for detecting infected animals.

Infectious Labial Dermatitis (Contagious Pustular Dermatitis or "Scabby Mouth").—The amount of "Commonwealth" virus vaccine issued (217,500 doses) was less than in the previous year (539,500 doses). The vaccine appears to be giving satisfactory control of the disease.

Melioidosis (Malleomyces pseudomallei infection).—The causal organism was cultured from two further sheep in the Hughenden district. No cases were seen on nine properties investigated in the Hughenden-Winton area. One of these properties had purchased sheep from the property on which the original diagnosis was made in 1949.

Three more goats died in the herd in which this disease was originally diagnosed in North Queensland. Forty-nine others were killed on the evidence of serum agglutination tests and melioidin reactions, and the organism was recovered from 12. Agglutination tests and melioidin tests have been used in an attempt to eradicate the disease from this goat herd and from the Oonoonba sheep flock.

Urinary Calculi.—Losses on five properties were investigated. Previous findings were confirmed, namely, that calculi are associated with ingestion of herbages of high oxalate and calcium (and often high magnesium) content, although other factors, as yet unidentified, are probably necessary to precipitate deposition of calculi.

A recent investigation in collaboration with the Sheep and Wool Branch and the Chemical Laboratory showed that when stud rams are confined in small paddocks and hand-fed supplements of grain and meal, the occurrence of calculi (calcium and magnesium carbonates) is perhaps attributable, not to the supplements fed, but rather to the oxalate- and calcium-rich herbages, which are apt to be abundant in such paddocks.

DISEASES OF HORSES.

Tallebudgera Horse Disease.—This rather peculiar disease of horses has been mentioned in previous reports. It is confined to certain areas of the South Coast and also occurs in New South Wales in those districts adjacent to the affected areas of Queensland. Wherever the disease occurs, Crofton weed (*Eupatorium adenophorum*) is found, and this plant has been strongly suspected of being the cause, particularly as it is readily consumed by horses. So far feeding experiments have been negative and animals have eaten several hundred pounds of the plant without ill effect. Further work is contemplated on this problem, which is quite a serious one in some of the farming areas involved.

Oesophageal and Stomach Ulceration.—This is another extraordinary condition in horses, first noted in North Queensland, where experiments left no doubt that it is caused by eating the plant *Crotalaria aridicola.* Ulceration of the oesophagus is one of the main lesions produced. This may lead to a condition in which the horses are incapable of eating or drinking, with, as might be expected, most distressing symptoms.

Recently cases were seen in Central Queensland, where horses were grazing in areas where *C. aridicola* is not found but another Crotalaria (*C. trifoliastrum*) is common. Experiments will be set up to determine the relationship of this plant to the disease, for the circumstantial evidence that it is the cause is very strong. It is worth noting that *C. trifoliastrum* is widespread in the Northern Territory but so far as is known the pathological condition seen in Queensland is unknown there, though the same plant is or was suspected at one time as being one of the causes of walkabout disease of horses.

Birdsville Horse Disease.—This condition was observed during the year in north-western Queensland. This is the first record from the area. It is of some significance that the plant concerned (*Indigofera enneaphylla*) was noted to be well grown, although the season was very dry, and that it was apparently palatable to the horses concerned.

DISEASES OF SWINE.

Swine Brucellosis.—Blood serum samples numbering 1,743 were submitted to the agglutination test, the majority of them being from the 69 herds listed under the Department's brucellosis-tested-herd scheme. Positive samples were received from only six herds.

Other Swine Diseases.—In addition to many specimens of swine organs and feeds, 74 pigs were submitted for post-mortem examination and diagnosis. The conditions found most frequently were salmonellosis, infectious pneumonia, Glasser's disease and various kinds of malnutrition. The acute septicaemic form of swine erysipelas was diagnosed in a herd at Nanango.

Tubercle-like Lesions in Lymph Nodes.—Many pigs' heads are condemned at abattoirs owing to the presence in the lymph nodes of lesions not easily distinguished from tuberculosis during routine meat inspection. As the cause of these tubercle-like lesions is obscure an investigation of the matter has been commenced.

Forty specimens have been secured from bacon factories and submitted to detailed pathological and bacteriological examinations. The results to date suggest that it may be possible by macroscopic examination to distinguish tuberculosis from the other infections in the submaxillary lymph nodes of swine, but the matter is being studied further before final conclusions are drawn.

POULTRY.

Salt Poisoning.—During the 1951 hatching season other Branches of the Department were advised by the Stations that some of the undiagnosed losses being encountered in baby chicks might be due to salt poisoning. Subsequently the condition was identified as the cause of loss in several flocks.

Chicks are much more susceptible to salt poisoning than are adult birds. Poisoning has been caused by one or more of the following: (*a*) errors in mixing mashes; (*b*) salt, being heavy, accumulating in the bottom of deep feed troughs; and (*c*) well waters of even moderate salinity being used with feed of raised salt content, giving an excessive total salt intake. Coarse grades of salt, which have of necessity been used at times in stock-foods lately, may also have contributed to these losses.

Botulism.—This form of food poisoning has been found several times in fowls and ducks examined at Oonoonba, the diagnosis being based on a mouse-inoculation test with blood from affected birds which has been developed there.

Avian Salmonellosis.—Twenty-three outbreaks of salmonellosis in chickens and five in ducklings were diagnosed. The average mortality was 24%. In chicks bought for a nutrition experiment at Yeerongpilly, several types of salmonella were isolated during the first seven days of life. The mortality in these chickens was only 2%. It would appear that chicks may carry salmonella when hatched but may suffer no significant mortality if the brooding and nutrition are good.

Pullorum disease continues to be of minor importance as a cause of loss of chickens, due to control of the disease in breeding flocks by the Department's blood-testing scheme.

Vitamin-A Survey.—Vitamin-A deficiency is common in Queensland flocks and was found in 48 batches of fowls submitted for examination during the year. It is due most often to failure to feed fish-liver oil or emulsion or a good-quality green feed.

In laying fowls, the symptoms of vitamin-A deficiency are usually easily recognised. In growing stock, on the other hand, the symptoms of deficiency simulate those of other nutritional disorders, while in baby chicks even gross deficiency may be expressed merely as poor viability accompanied sometimes by brain disorder in a few birds.

A survey of the vitamin-A status of fowls submitted to Yeerongpilly for diagnosis is being made in collaboration with the Chemical Laboratory. The aims are firstly, to determine how often deficiency remains undetected because it is not severe enough to produce distinctive symptoms or lesions, and secondly, to define the effect of borderline deficiency on the incidence of other diseases, on growth and production and on the viability of day-old chicks.

POISONING OF LIVESTOCK.

Chemical.—Losses due to poisoning by chemical substances were identified as follows—

Arsenic—in 37 separate herds of cattle, one flock of sheep and three flocks of fowls.

Lead—in cattle on 17 occasions, twice in dogs and once in fowls.

Salt—twice in chickens and once in hens.

Phosphorus—was responsible for the death of three dogs.

Nitrite—nine out of 29 porkers died suddenly at a piggery at Eidsvold. The water contained a high level (2,005 p.p.m) of sodium nitrate. At Proston, deaths occurred in pigs fed wheat soaked in water found to contain 890 p.p.m.

Creosote—poisoning occurred in a calf at Oonoonba kept in a pen that had received a recent application of creosote.

It is noted again that arsenic poisoning causes a great deal of unnecessary loss of stock, mostly through carelessness with dipping fluids, weedicides, discarded containers, etc. Lead poisoning of cattle, due usually to licking paint or paint ingredients, is being recognised more frequently since attention was drawn to the matter in 1949.

Plant Poisoning.—Drought conditions over much of the State from August to January accentuated the number of deaths from plant poisoning, due to animals eating plants they would not normally touch.

The following plants were suspected of causing deaths in cattle:—

Cestrum parqui (green cestrum)—at Beaudesert, Toogoolawah, Harrisville and Brisbane.

Cestrum nocturnum (night-flowering cestrum) at Warwick.

Trema aspera (wild peach)—at Gayndah.

Hoya australis (Hoya vine)—at Gayndah (twice) and at D'Aguilar.

Xanthium pungens seedlings (Noogoora burr)—at Wandoan (4 herds) and at Injune.

Asclepias fruticosa (narrow-leaved cotton bush)—at Gayndah.

Castanospermum australe (Moreton Bay chestnut)—beans of this tree were suspected of causing mortality at Miriam Vale.

Terminalia oblongata (yellow-wood)—caused Mackenzie River disease at Emerald.

Lantana—bull at Beenleigh.

Sorghum sudanense (Sudan grass)—caused HCN poisoning at Maryborough.

Nicotiana spp.—travelling cattle at Mungindi.

Duranta repens—cow at Oxley.

Myoporum acuminatum—at Rockhampton.

In addition to the above records in cattle, staggers in lambs due to stagger weed (*Stachys arvensis*) occurred at Toogoolawah and pigs were poisoned by Noogoora burr seedlings at Rockhampton.

Losses due to ingestion of plants rich in oxalate were recorded on four occasions as follows:—

(*a*) Four deaths among 30 fat cattle yarded at Emerald for about three days and then grazed on a heavy stand of black pigweed (*Trianthema portulacastrum*) and pigweed (*Portulaca oleracea*). Samples of these plants contained respectively 9.6% and 8.3% oxalate expressed as oxalic acid (on a dry matter basis).

(*b*) Two deaths and several sick among 200 cows yarded each night then grazed on heavy stands of black pigweed at Emerald.

(*c*) Twelve deaths among 369 fat cattle yarded at Cunnamulla for four days without feed and then put in yards where there was a lush growth of pigweed and also some black pigweed.

(*d*) Two deaths among 268 rams unloaded at Cunnamulla after being 25 hours in trucks then grazed on a profuse growth of pigweed (*Portulaca oleracea* or *P. intraterranea*). Samples of this pigweed contained 7.0% oxalate.

It was noted that starvation was a factor in all these losses.

Poison Plant Feeding Experiments.—Ironwood (*Erythrophleum chlorostachys*) is widely distributed in North Queensland and extends across the Gulf country. It has been considered very poisonous, large numbers of stock being lost from eating the leaves during drought. The effects of the plant and the amount required to cause death have not been determined experimentally. Feeding tests reported last year showed that less than two ounces of air-dried leaves was poisonous to horses. Further tests with air-dried leaves have been done at Oonoonba. The results were:—

Horses—one ounce of leaves caused death in four days. One-tenth ounce of leaves caused only depressed appetite for two days.

Cattle—four ounces of leaves killed a 600 lb. steer in less than 36 hours. One ounce fed to a 500 lb. steer caused nasal discharge, increased docility and trembling; the animal recovered after three days.

Sheep—one sheep 60 lb. liveweight fed one ounce of whole leaves died within 16 hours. Another sheep 60 lb. liveweight, fed a quarter of an ounce, showed mild symptoms (fast breathing and diarrhoea) for three days then recovered.

The woolly water-lily (*Philydrum lanuginosum*) has on occasions been suspected of poisoning stock. To test this an A.I.S. calf weighing about 250 lb. was fed 325 lb. of the plant during a period of 26 days with no apparent adverse effects on the animal.

The milky sap of brush poison bush (*Excoecaria dallachyana*) has been reported to have an irritating effect on the eyes of man and animals. The green milky parts are reputed to be poisonous to cattle. Following reports that this plant was suspected of causing mortality in cattle during the year, a feeding test was done at Yeerongpilly.

Two sheep and one calf were fed for 41 days and 19 days respectively on fresh green leaves from Boonah. The sheep were fed 40 lb. and 34 lb. respectively and the calf 44 lb. No ill effects were produced. The toxicity of this plant is therefore very doubtful.

A feeding trial with *Cycas media* at Oonoonba showed that 118 lb. fed to a 500 lb. steer over 32 days did not produce ill effects.

Phaseolus lathyroides.—At Oonoonba no ill effects were produced in two pregnant cows fed 3,180 lb. and 3,540 lb. of *Phaseolus lathyroides* in 66 days and 72 days respectively.

SHEEP AND WOOL BRANCH.

Mr. G. R. Moule, Director of Sheep Husbandry.

Adverse seasonal conditions were experienced in the greater part of the sheep pastoral country during the year. Following the very bounteous season of 1950 and the heavy rains early in 1951, there was a large body of feed in all pastoral districts at the beginning of the year under review. However, the grass was dry and some wool-growers had not taken reasonable precautions against the spread of bush-fires.

Thunderstorms which were characterised by light falls of rain and intense lightning occurred in the Maronoa and Warrego districts during the early part of the summer of 1951-52. These were responsible for the ignition of many bush-fires. It is very difficult to clear wide belts of land in the forest country which occurs in these parts. Aircraft were used for locating fires and directing the efforts of land parties which were cutting firebreaks or moving stock. Fortunately, comparatively few sheep were lost, but serious damage was done to fencing, which has been difficult to repair. As many miles of fencing had been damaged by floods in the previous year, the present facilities for the control of grazing animals are not very good in the affected areas.

By the spring of 1951, drought conditions threatened a large part of pastoral Queensland. Light rains occurred over several days in a number of districts in October and totals of up to two inches were recorded. However, the weather was hot and evaporation high and most of the moisture was lost before it became available to pasture plants. Widespread heavy rain occurred in the Central Highlands during December and some thunderstorms brought useful falls to the Blackall, Longreach and Hughenden districts, but these fell over restricted areas. Monsoonal rains fell over the greater part of eastern Queensland during February, but the central-west, far-west and north-west did not benefit. A cyclonic disturbance brought effective rain to the Cloncurry and Boulia districts and to some areas west of Longreach. However, the area extending north from Longreach to Winton, Hughenden and Julia Creek did not receive any useful rain from either of these movements and by autumn the seriousness of the position in these areas was apparent.

Intense heat occurred for prolonged periods during the summer and this dried up the feed still more. Some light falls of rain occurred between Julia Creek, Hughenden and Longreach during February, but these damaged the existing pastures and accentuated the difficulties of wool-growers in these areas. Although some agistment was available by the end of summer, ruling rates were high and the price of wool was showing some decline. At the same time there was very little fodder available for hand-feeding sheep. It was apparent at the time that anybody who commenced hand-feeding might be committed to such a policy for at least nine months. The north-west has not yet received any effective rain and with the advent of frosts heavy losses can be expected in flocks still in this area. The gravity of the position has been reflected in the sheep market in the north, where one line of old ewes fetched as little as 11s.

Sheep numbers in Queensland have shown a further decline. Lamb-marking percentages recorded during the financial year were among the lowest on record. As only 6,800,000 ewes were mated during the previous year, it is clear that the natural increases would not have been sufficient to meet the normal losses due to age and slaughter. Returns submitted by wool-growers to the Government Statistician show the sheep population at March 31, 1952 to be 16,156,400, compared with 17,477,578 in the previous year. During the greater part of the last decade, sheep numbers have been below the 60 years' mean of 18.5 million and there is at present little indication of likely improvement in the near future.

The cut per head of sheep in Queensland has shown a satisfying increase during the history of the industry and remains reasonably high. However, progress during the last three decades has been slower. This is partly due to the fact that further improvement automatically becomes more difficult the higher the general level of production is raised. It is, however, due in some measure to the fact that fewer improvements, such as provision of permanent water and of fences, have been effected during the period.

During the year, 464,000 bales of wool were sold in Brisbane. Practically all this represented the current year's production, as the Australian Wool Realisation Commission had marketed, prior to the commencement of season, nearly all the wool it had on hand as the result of the wartime stock-piling. It is doubtful if wool-growers appreciate the enormous task with which the A.W.R.C. was faced. Not only did it arrange the orderly marketing of a very large quantity of wool but it also collected one of the most valuable sets of figures pertaining to the Australian clip which has ever been compiled. As forecast in the previous year's report, the price of wool declined during the year. This trend, combined with the decrease in the amount of wool marketed, reduced the value of the State's wool clip to £48,957,421. This shows a decrease of £50,178,979 on the previous year's return, which was the highest ever obtained in any one year. The number of bales marketed in Queensland during the year was 467,265 (554,705 in 1950-51) and the average price per lb. was 84.9d. (143.78d. in 1950-51). However, the wool industry once again earned more than any other in Queensland.

The supply of sheep to the Brisbane Abattoir has not been very good and ruling prices have been high. As the State's flocks consist almost entirely of Merinos, there are very few sheep kept specially for their mutton qualities. Despite the efforts of the Department to popularise the crossbreeding of some sheep for mutton production and the raising of some lambs in conjunction with dairying; comparatively little interest has been shown in these forms of animal production. It is apparent, however, that production in Queensland will have to be diversified more to include the running of several types of livestock in the sub-coastal agricultural country and that agricultural pursuits will have to be extended into areas such as the Maranoa and the Central Highlands which are used extensively for pastoral production.

EXTENSION SERVICES.

A school for sheep and wool extension workers, arranged by the Agricultural Research Liaison Section of C.S.I.R.O., was held in Brisbane early in September. The school was conducted by officers of C.S.I.R.O. in conjunction with this Branch. This organisation has been mainly responsible for the conduct of fundamental research, while the State Departments of Agriculture have the responsibility of seeking field applications of the results which emerge and of carrying this information to the producer. The Research Liaison Section, established within C.S.I.R.O. last year, should do much to speed the transmission of information from research workers to the extension services maintained by the State Departments.

It will probably be difficult to get some of the information given at the school accepted by the industry, as it introduces a rather new concept of animal breeding.

The information that is carried to producers must be in a workable form and facilities must be available to help wool-growers in the necessary collection and interpretation of figures pertaining to other animal-breeding practices.

While valuable information is imparted to officers attending such schools, it is well to keep in mind some of the difficulties associated with extension work to an industry of the dimensions and type of the sheep industry in Queensland. There are about 4,600 properties on which sheep are depastured in Queensland. At the present time there are 13 advisory officers located in the sheep country. The majority of these men spend about 85% of their time in the field, and as there are only about 230 working days in the year, it means that no extension officer can spend a full day per annum on each of the 330 properties whose owners he should contact. Apart from this aspect of the matter, many properties are situated at a very considerable distance from the headquarters of the nearest adviser. While this focusses attention on the necessity of placing more men in the field, it also indicates the need for developing more "wholesale methods" in extension work.

The school was generally held to have been a most successful innovation. The information made available can be classified as:—

(1) Fundamental, which gave officers a better insight into some of the methods they were using and the problems they have encountered.

(2) Pointer information which opened the way for the development of projects in the field.

(3) The practical viewpoint. This was put before the research workers by field officers at the school.

(4) Information with immediate field application.

Good use has already been made of the last, and projects consequential to the school are already in hand. These include the collection of data on inherent defects in sheep, the influence of environment on wool production and the collection of vital statistics pertaining to the sheep industry.

The specialist school arranged by the Research Liaison Section of C.S.I.R.O. was preceded by a school of instruction arranged for officers of the Sheep and Wool Branch on its own account.

EXTENSION WORK.

Field officers continued with extension work in the field. Demonstrations were given on properties and field days were conducted. In addition, advice on a variety of subjects was given in 2,170 instances. A diagrammatic dissection of this work is shown in Figs. 1 and 2. The details pertaining to each section are as follows.

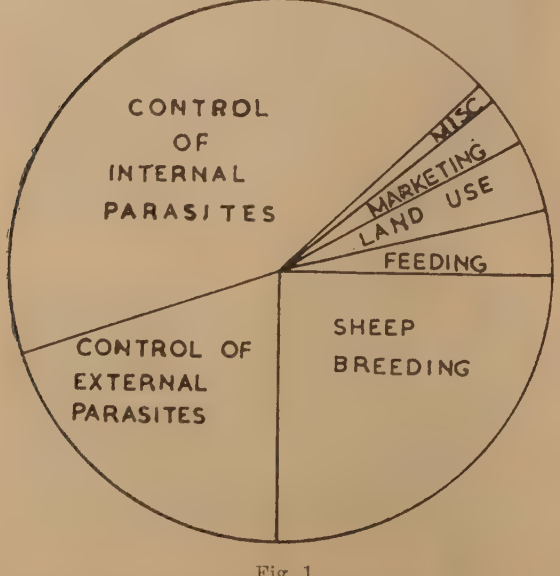


Fig. 1.

DISSECTION OF SUBJECTS ON WHICH ADVICE WAS GIVEN TO WOOL-GROWERS IN 1951-52.

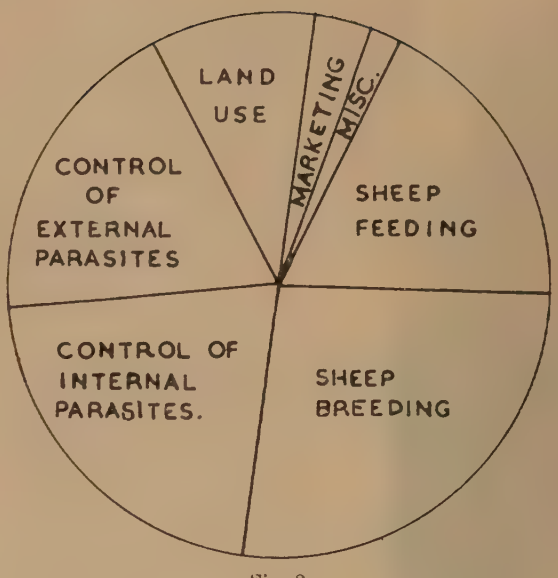


Fig. 2.

DISSECTION OF SUBJECTS OF DEMONSTRATIONS GIVEN TO WOOL-GROWERS IN 1951-52.

Hand-Feeding Sheep in Drought Time.—When grazing fodder becomes short a number of factors have to be considered before a decision can be made about the steps any wool-grower can take to meet the situation. These might be enumerated as:—

(1) The reliability of rain at the time of the year when the shortage occurs.

(2) The state of the flocks, with special reference to lambing.

(3) The value of the sheep at the time the food becomes short and their likely value at the end of the drought.

(4) The effect the sale or saving of sheep will have on the income tax assessments the wool-grower will receive.

(5) The availability of agistment, edible scrub, fodder and labour.

(6) The probable earning capacity of the sheep during drought.

It has been found cheaper and preferable to move sheep to agistment than to undertake hand-feeding. This permits normal lambing and better growth of young sheep. Less labour is required and the success of the move is not subject to variations in market price and in supplies. In those districts where scrub is available, it is generally preferred to cut scrub rather than move the sheep.

During the past year, drought conditions prevailed also over the greater part of the dairying districts. As only limited fodder was available, keen competition was evidenced at the Brisbane markets and the price of lucerne chaff rose to a peak price of £71 a ton. Grains were available at between £30 and £40 per ton.

From a study of the cost of moving sheep and moving fodder, it became clear that, if the drought were to extend beyond 120 days and hay and/or chaff were to be fed, then it was generally cheaper to move the sheep to the fodder than the fodder to the sheep. This time would be doubled if grains were used, but it is fairly clear that there is little chance of any large quantities of grain being available for the feeding of sheep for at least some years to come. This raises the question as to the way in which drought conditions might be met by the industry in the future. It is clear that far greater attempts should be made to use material which exists in the sheep country and to develop those areas where any type of crop can be grown. Even the quick-growing millets would make a valuable contribution if grown and stored as hay in marginal agricultural areas to which the sheep can be moved during drought time.

Sheep Breeding.—An increasing amount of information has been sought by graziers from field officers on sheep breeding, especially in relation to improving reproductive rates. The year 1951, like 1950, was a bad lambing year throughout the greater part of Queensland. This could be due to several factors, including the following:—

(1) Graziers were keeping older breeding ewes because of the heavy losses during the 1950 floods.

(2) The condition of the pastures during early 1951 was generally poor and they would have been low in protein and vitamin A, both of which are necessary for the production of normal semen by rams.

(3) A late-summer heat-wave in March, 1951, in the Maranoa and south-western divisions may have influenced the fertility of rams adversely.

(4) Heavy lamb losses due to predators were suspected in some areas.

The advisory staff also received many enquiries relating to methods of selection and breeding plans which might be used to breed better sheep. The information this Branch has to offer on this subject is new, but field officers are addressing themselves to the problem of acquainting wool-growers with the application of modern genetic knowledge. It is envisaged that a series of field days will be conducted during 1952 in an effort to wholesale this information. The first of these was held during June.

Marketing.—General extension work on the preparation of wool for marketing was undertaken. Advice was also given in many areas regarding the disposal of sheep in connection with drought.

Control of Internal Parasites.—An increasing amount of work on this subject was undertaken throughout the year. This was necessary because of the heavy carry-over of worm infestations which resulted from the bounteous seasons of 1949-50 and the sudden fall in the plane of nutrition during 1951. In many instances wool-growers did not realise the trouble and a considerable amount of patience has been necessary in carrying out extension work. As phenothiazine was difficult to obtain, many sheep were not treated in August and in these circumstances it is probable that many flocks were re-infested during the summer.

External Parasites.—The period from early 1951 to early 1952 was one of little or no blowfly activity in most of the sheep-raising districts of Queensland. The usual spring and autumn fly waves were negligible in most areas and very seldom was a 5% or greater incidence of strike noted.

During 1951 there was the usual spread in a westerly direction of body lice affecting sheep. This commonly occurs during and/or following bounteous seasonal conditions. For many graziers this was their first experience of lice and the assistance given by the field staff was very welcome. In other cases wool-growers appear to be more aware of the financial loss which results from lice spoilage amongst clips.

Land Utilisation and Improvement.—Because the field officer sees different improvements on different properties he is in a very good position to measure one against the other. The value of the field officer's advice in these matters is being recognised by the industry and extension work on them is continuing to increase.

FIELD INVESTIGATIONS.

Lowered Cuts per Head.—An investigation of the causes of lowered cuts per head and low lamb-marking percentages of sheep in the Stanthorpe district has been started. It was found that a fairly large proportion of sheep grow abnormal wool. There were signs that some sheep had suffered from a seasonal calcium and/or copper deficiency. These investigations will be continued. Blood and serum samples will be taken at intervals.

Branding Fluids.—Field work was undertaken in connection with a trial to determine under field conditions the merits of a branding fluid known as L.B.E. This fluid was first formulated by C.S.I.R.O. From observations carried out so far it seems likely that more work is needed on this subject, with particular reference to the influence of the semi-arid tropical conditions.

Cobalt Deficiency.—Losses of sheep in the south-west were investigated and these appear to be due to cobalt deficiency. Facilities for conducting a feeding trial were not available, but the symptoms, characteristic of a fairly rapid wasting disease with an anaemia, were indicative of the occurrence of a deficiency amongst wethers. This is rather unusual during dry seasonal conditions, and so far as is known it is most unusual when sheep are grazing top-feed such as mulga.

Miscellaneous.—A number of investigations were undertaken following mortality in sheep or reports that the flocks were not doing well. These included losses due to carbon tetrachloride poisoning, fluorosis, malnutrition, melioidosis, over-eating sheep nuts, plant poisoning, copper deficiency and spear-grass irritations.

RESEARCH WORK.

The Climatic Factor in Drought.—When plans were being made for the expansion of the branch in 1945, it was considered advisable to develop an ecological approach to various problems of sheep husbandry. Deficiencies in the information which was available about the pastoral environment led to the commencement of studies in this subject, with special reference to the distribution and reliability of effective rainfall in the semi-arid pastoral country. This work was completed by the end of 1948 but it was apparent by that time that a good many of the basic data which were obtained could be used in a survey of the incidence of drought. The term "drought" cannot be considered apart from land utilisation. Precipitation too meagre to maintain growth of agricultural crops may still be adequate for pasture. Also, an amount of rain which would give normal growth of indigenous pastures in one area may for another district be quite inadequate. Obviously, then, the climatic criteria for drought must vary with the crops grown and the pasture species as well as with locality. As the seasonal conditions cannot be altered, it is clear that the grazing pressure is the only variable under the control of wool-growers which can be modified.

Because drought is such a feature of the pastoral environment it was decided in 1949 to continue work on the climatology of Queensland. This work has now been completed. Most of the work was undertaken in succession by Misses Elizabeth Baynes and Sylvia Cossins, who worked in collaboration with Mr. S. L. Everist and the writer. The salaries of Miss Baynes and Miss Cossins were paid from a grant from the Wool Research Trust Fund. The work involved detailed studies of the total rainfall received each month at 49 centres for as many years as records existed. The individual monthly falls for each centre were classified as being effective or not for the stimulation of plant growth by considering the ratio of the rainfall to the evaporation. Everist established that a ratio of rainfall to evaporation rate of 1 to 5 was sufficient to promote the growth of Mitchell grass in summer. After each monthly total for each centre had been classified as effective or not, the following calculations were made:—

(1) The number of years for which records existed in which effective rain was received in each calendar month.

(2) The frequency of at least two months of effective rain in the late-summer months of January, February and March.

(3) The frequency distribution of monthly rain for class intervals of 100 points.

(4) The length, distribution and sequence of periods when no effective rain was received.

(5) The length of summer and winter growing periods as well as those which overlap from one period to the next.

In addition, an assessment was made for each centre as to whether each individual year was good to fair, mediocre, or bad for sheep-raising and wool-growing, or whether it received no effective rain. It is not possible at present to present the results from such a survey in a report of this nature, but a photographic copy of the results obtained from the assessment of seasons is presented in Fig. 3. Incidentally, 1950 stands

out in the figure as being the only one in which a good season was experienced over the whole of Queensland. This work has already proved of tremendous value in advising wool-growers about the hand-feeding of sheep during drought time and in relation to the mating of flocks. It has also been useful in relation to land utilisation and probably it is here that the findings have their greatest value.

FIG 2

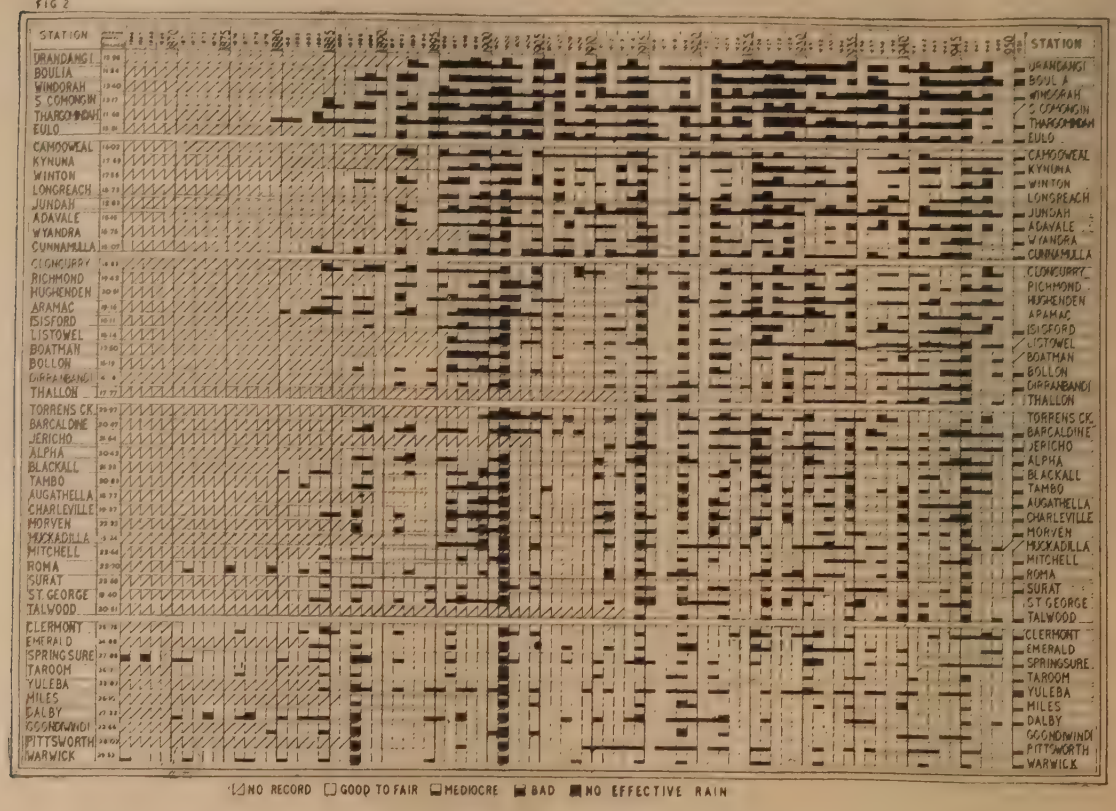


Fig. 3.

DIAGRAM SHOWING THE NATURE OF THE RAINFALL AT 49 CENTRES OVER PERIODS UP TO 85 YEARS.

Investigation into "Doggy" Wool:—A long-term investigation has been commenced into the occurrence of "doggy" Merino wool. Such wool lacks elasticity, character and handle. The staple is usually much shorter than it should be in relation to its quality. This type of wool has poor manufacturing properties, and consequently commands a lower price. Although definite results are not yet available, it might be worth while to outline the background to this problem.

The wool follicles from which wool is formed begin to develop in the skin of the sheep at about the fortieth day of gestation. The first follicles are known as primaries and are distinguishable microscopically from those which develop at about the eightieth to the hundreth days of gestation, because the former have a sweat gland and a small muscle attached to them. This muscle in sheep is no longer possessed of any function. The fibres which grow from primary follicles are usually coarser and harder than those which grow from the secondaries. True wool fibres grow from the secondary follicles, but the extent to which these function during the life of the sheep depends upon the plane of nutrition, the stress of pregnancy, lactation and/or parasitic infestation. Generally speaking, when the sheep is subjected to nutritional stress, and particularly to shortage of protein, it reduces the diameter of the fibres produced by decreasing the "bore" of the follicles. This decrease is greater in the fibres growing from the secondaries than in those growing from primaries, and if conditions become severe enough some of the secondary follicles go out of production altogether.

In the investigations which are in progress, two determinations are being made on samples of wool and skin taken from two groups of sheep, one of which it is thought will continue to grow normal wool and one of which it is thought will go "doggy". The original selection was made on the texture of the birth-coat, which, it was felt, should reflect genetic influence as all the mothers of the lambs had enjoyed the same grazing conditions. There was a conspicuous difference between the average diameter and evenness of diameter of the fibres produced by the two groups. The group which it is forecast will become "doggy" grew wool which was of greater average fibre diameter and which was more uneven than that grown by the other group. Preliminary investigations indicate that the ratio of primary to secondary fibres is considerably higher in this group. In both groups, the average diameter has fallen markedly since the work started.

Investigations into Deaths amongst Lambs.—Investigations into the sheep's physiology have shown there is a certain rhythm in the reproductive functions of ewes and that the fertility of rams is influenced by the weather and the state of the pasture. A considerable amount of effort has been directed towards overcoming difficulties associated with the obtaining of high conception rates amongst ewes, but until recently little consideration had been given to the survival of newborn lambs. Eleven observations by members of the Sheep and Wool Branch were made during 1949, 1950 and 1951 on properties situated between Dirranbandi and Julia Creek, and these revealed that it was probable that over three million lambs died between birth and lamb-marking in tropical Queensland alone. The seriousness of this hitherto unrecognised loss is apparent from the fact that only 5½ million lambs were marked north of Longreach during the three years in which the observations were made. That is to say, over one-third of all the lambs born died before marking. The most important causes of lamb losses were low birth-weight, starvation (due to poor mothering ability of the ewes), attacks by pests such as pigs, foxes and crows, and exposure to heat and cold. The effect of low birth-weight on survival is illustrated in Fig. 4, which shows the percentage losses of lambs in the different weight groups. Blindness of the ewes' teats due to shearing wounds or to mastitis was one of the most important factors contributing to starvation of lambs, although a lot of lambs were so weak at birth that they were unable to suckle. Weakness of the lambs may have resulted from deficiencies in the diet of the ewes during gestation, from decreased activity of the ductless glands during hot weather, or from infections. Losses due to predators varied during the different observations. This was due to fluctuations in the populations of wild pigs, foxes and probably crows.

The first-mentioned increased rapidly during the bounteous seasons and the plagues of bush rats which occurred during 1950. In reviewing methods which might be undertaken to reduce lamb losses, the destruction of pests likely to attack lambs is recommended, and it is considered that attention should be given to the state of the ewe's udder when sheep are being classed. Further research is necessary to determine why lambs carried during the summer are smaller and weaker than those born after the winter.

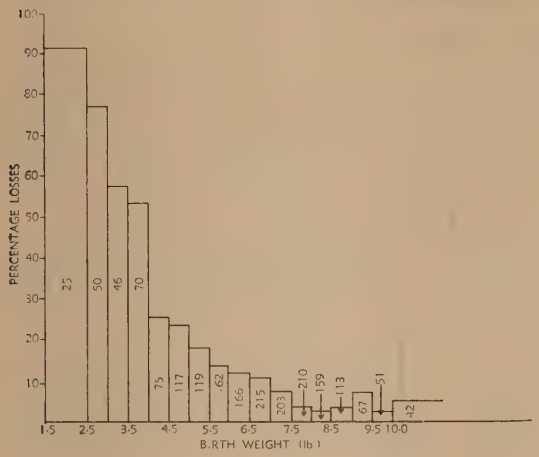


Fig. 4.

GRAPH SHOWING THE RELATION OF BIRTH-WEIGHT OF LAMBS TO PERCENTAGE LOSSES. The numbers in the rectangles are the total numbers of lambs in the various weight groups.

Mules Operation Trial.—A trial to compare the modified Mules operation with the radical operation as done by Cole (New South Wales) has been undertaken. There has not been a fly-wave since the sheep were treated and it has not been possible to assess the protection against flies given by each method. However, the following observations on healing were made.

(1) With few exceptions, tails were completely bare of wool in the radical group.

(2) Bush-fly activity caused greater distress in the radical group.

(3) Severe sunburn of the tail and vulva were recorded in the radical group.

(4) On appearance, the resulting bare area was larger in the modified Mules group.

These observations are to be continued and any incidence of strike will be recorded to compare one group with the other and both groups with the controls.

WOOL BIOLOGY LABORATORY.

Much of the work carried out by this section during the year was of an investigatory nature and has been recorded in other sections of this report. Samples from rams and stud sheep were sent in by field officers and graziers for analysis. However, the industry as a whole still has to become cognizant of the facilities this branch now has to offer in the study of wool in connection with breeding plans. Reports of wool analyses have been forwarded to all field officers in order to familiarise them with the work, and to give them "talking points" to take to producers.

TOORAK FIELD STATION.

Improvement work has progressed satisfactorily throughout the year. The following work has been completed:—

(1) The homestead has been repaired, gauzed, and provided with new bathrooms and lavatories. A new water supply has been provided.

(2) A cookhouse has been built and equipped and the dining-room repaired and raised.

(3) An office has been built.

(4) A cottage has been provided for the overseer.

(5) An implement shed has been built.

(6) The meathouse, men's dining-room and engine room have been repaired and moved to more appropriate sites.

(7) A shearing shed and shearers' quarters have been constructed and equipped.

(8) A set of sheep-yards has been constructed.

(9) Bore drains have been redesigned, surveyed and constructed to give better utilisation of existing water.

Three experiments are being conducted at present with the flock on the property. These are concerned with the following.

(1) Hand-feeding sheep during drought.

(2) The incidence of oestrum in Merino ewes depastured in the tropics.

(3) The use of urea as a protein substitute. This experiment is being carried out in conjunction with C.S.I.R.O.

SHEEP AND WOOL STATISTICS.

(Source: Queensland Government Statistician.)

SHEEP NUMBERS (as at March 31).

Year.	Number.
Average—	
1936 to 1940	21,583,862
1947	16,084,340
1948	16,742,629
1949	16,498,957
1950	17,582,152
1951	17,477,578
1952	16,156,400

WOOL.

Year.	Number of Sheep Shorn.	Weight of Shorn Wool (including Crutchings).	Average Weight of Fleece (including Crutchings).
		Lb.	Lb.
Average—			
1935–36 to 1939–40..	21,296,000	163,126,000	7·66
1946–47 ..	17,807,000	138,232,000	7·76
1947–48 ..	16,833,000	136,780,000	8·13
1948–49 ..	17,156,000	141,379,000	8·24
1949–50 ..	17,182,000	146,429,000	8·52
1950–51 ..	17,800,000	139,537,000	7·84

CATTLE HUSBANDRY BRANCH.

Mr. R. D. Chester, Officer in Charge.

The abnormally early termination of the wet season in the 1950-51 summer, followed by subnormal rains in the summer of 1951-52, created very serious drought conditions throughout the beef and dairying districts during the year under review. In the Burnett River basin and on the Central and North Coast areas of the State, heavy stock losses in both beef and dairy cattle were experienced early in the year. Later, similarly severe losses were experienced in the north-west. On the Central Highlands and in the Upper Dawson and Maranoa, conditions were not so serious, many cattle being saved from starvation by rains falling at the critical time.

Statistics of livestock in Queensland at 31st March, 1952, showed that there were 1,296,400 dairy cattle (1,440,198 in 1951) and 5,137,500 beef cattle (5,293,350 in 1951).

Light rains which have been experienced at frequent intervals in the eastern part of the State since February and March have ensured an excellent pasture season during the late autumn and early winter months; in fact, in many parts of central and southern Queensland the present winter is one of the most favourable experienced for several years. In the north and north-west, rains have been patchy and the position in these areas is still uncertain. The absence of flood rains for more than 18 months has created a critical position insofar as water supplies are concerned. Under the present favourable winter conditions, water reserves are being maintained, but surface waters are far below normal levels and without good spring or early-summer rains, the position could deteriorate very rapidly in all parts where cattle depend on surface water.

PRODUCTION.

The prolonged dry season experienced for a period of 12 months from February 1951 adversely affected production of both beef and dairy produce.

Owing to the abnormally dry spring in 1951, mortality amongst breeding cows and calves was very heavy. Because of favourable conditions at mating in the summer of 1950-51 calvings in the spring of 1951 were considerably above average, but as in most areas the calves were reared under extremely adverse conditions, where death did not occur growth rates were retarded and small, weedy weaners predominated amongst those surviving when the mid-autumn rains came.

Beef Cattle Industry.

There has been a serious slump in beef production for the year. This fall, due chiefly to drought conditions in the spring and summer months, has only affected the export trade. Monthly killings at export works declined from October onwards. The killing season in 1952 started rather later than usual, and export killings for the period January to May, 1952 inclusive were down approximately 50% on those for the same period in 1951 despite the fact that killings for the 12 months ending May 1952 were only 30% lower than in the year ending May 1951. It is expected that slaughterings in late-winter and spring will be near normal because of the favourable winter season.

Brandings during the year under review seem certain to show a very serious decline on the previous year and may be the lowest since 1946. Excellent calvings were obtained in the autumn of 1951, but many of these calves did not survive owing to the hard winter and spring season which followed, and in the spring of 1951 mortality of newborn calves and their dams was very high. Autumn calvings in 1952 were poor because of low fertility of bulls at the time of mating in the winter of 1951. This in turn was due to the prevailing drought conditions.

Although brandings during the year are likely to have been much lower than for several years past, the most important effect of this will not be apparent for a period of four to five years, when calves branded in 1951-52 would normally be reaching the market.

Hoof movements of cattle from the Northern Territory to Queensland in recent years have made a substantial contribution to Queensland's beef output. Owing to the very severe nature of the drought in the north-west of Queensland and in the Northern Territory, movement of cattle from the Territory into Queensland will be restricted.

Dairying Industry.

Dairy production showed remarkable fluctuations during the year and the rapid recovery of the industry from one of the most severe droughts experienced illustrates the remarkable recuperative powers of the dairy cow. Spring and summer production showed a very steep decline on the previous year's production. In some of the worst affected areas of the Burnett and Wide Bay, many cows were lost by starvation. For a period early in 1952, the milk supply to Brisbane was seriously short of requirements. Good early-autumn rains encouraged excellent pasture and crop growth, and as these rains were followed by a mild, wet early winter, almost ideal conditions for production were experienced. Production, therefore, has been at a relatively high level and prospects for the spring months are excellent.

High prices for cattle fodders and a shortage of most grains during the greater part of the year tended to adversely affect the production in herds where the dairyman relies in part on purchased fodders. This has been particularly apparent in the metropolitan milk supply area.

The ability of the dairy cow to recover quickly from the effect of drought and to produce reasonably good quantities of milk on the abundant feed available over a short period is perhaps one important reason why fodder conservation is not practised to a greater extent by Queensland farmers. Excellent as the production may appear by Queensland standards in these times of abundant fodder the overall production is unsatisfactory when compared with that obtained in some other countries. There is little doubt that the production per cow in Queensland could be increased by at least 100 lb. of butterfat per annum by the adoption of proper feeding methods. For the economic production of the amounts of dairy produce likely to be required by this country, it is essential that much greater attention be given to the production of home-grown roughage feeds and to the storing of these feeds in good seasons against the time when they will be required in poor seasons. The purchase of fodder for dairy stock is difficult to justify except in certain special instances. Each dairy farm should be a self-contained unit producing fodder essentially for marketing through the dairy cow as milk or cream. Information in possession of the Branch indicates that fodder can be grown and conserved on the average dairy farm at 1½d.-2½d. per food unit. Fodder purchased at the Roma Street market in Brisbane would cost 5d.-10d. per food unit at present market rates.

Extension work in the dairying industry has been concentrated on attempting to improve the general nutritional status of the dairy cow through improved

farm management and the production of larger quantities of home-grown fodder. Climatic conditions in Queensland are such that it is normal for the nutritional status of pastures to be at sub-maintenance levels for dairy cows during some months of each year. In order to maintain reasonable production, therefore, the farmer must plan calvings for the most favourable time of the year and/or grow crops for grazing and conservation in order to carry the milking herd through the lean periods. Increased prices for dairy produce have placed the dairy-farmer in a much sounder economic position and the average farmer should now be able to find capital for increasing fodder production with the aim of lifting milk output.

Figures collected by officers in the field clearly show that the conservation of fodder is an economic proposition in most agricultural areas. The efficiency of advisory work in the dairying industry depends on the ability of officers to take full advantage of specialised work done by officers of the Agriculture Branch on the one hand and the Herd Recording Section on the other. Consequently, the closest possible co-operation has been maintained with these two branches of the Department. While it is gratifying to be able to record that this co-operation has yielded excellent results, it is disappointing that because of the staff position it has not always been possible to give as much assistance to the Herd Recording Section as should be the case. There is sufficient material available now from group herd recording returns on which to base an efficient extension service, but in some districts trained staff is not available to make use of these data.

CROP-FATTENING OF BEEF CATTLE.

Increased beef prices have stimulated interest in crop-fattening of beef cattle, particularly in south-eastern Queensland but also to a lesser extent in Central Queensland. Several farmers in the Brisbane Valley sowed small areas of winter crops in 1952 for feeding-off with beef cattle, and there are indications of a return to crop-fattening on the Darling Downs, where in recent years the trend has been from cattle to straight grain production.

A weighbridge has been installed on a property in the Brookstead district, and it is hoped to obtain much useful information on the growth rates of cattle on various crops.

Good-quality bullocks were turned off crops in the Central Highlands during the year at a time when few fat cattle were available from natural pastures. This has further stimulated the interest of small landholders in the district in the possibility of combining the production of grain sorghum with cattle-fattening. It is anticipated that while favourable beef prices are available for good-quality cattle there will be a considerable expansion of this type of production in Central Queensland.

GROWTH RATES OF BEEF CATTLE.

Information on the normal growth rates of beef cattle on natural pasture is essential to the interpretation of results of improved husbandry techniques in the beef industry. A start has been made in an effort to obtain figures for the growth rates of cattle under various environmental conditions in Queensland.

In Central Queensland cattle are being weighed regularly from birth to maturity and complete records of the nature of the fodder available are kept in conjunction with growth-rate figures. Similar work along these lines is planned for the Mooloolah district in association with copper-supplementation trials, and on the Darling Downs as an adjunct to crop-fattening work. As finance becomes available for the purchase of suitable cattle weighbridges, it is hoped to extend this work to other districts of the State.

On the Central Queensland property, a small bull-proving project has been started. The progeny of the three top bulls selected by the studmaster will be weighed at regular intervals and an attempt made to assess the worth of the bulls on the growth rates of progeny. Both male and female offspring will be used in this trial.

STUD CATTLE FEEDING.

Field officers are called on from time to time to give advice on the technique of preparing beef cattle for show. Sufficient information is available from overseas sources for the preparation of standard rations. The availability of various concentrates in Queensland necessitates some modification of overseas standards, and conditions in districts other than the Darling Downs frequently require that further modifications be made in the rations fed. The co-operation of one large stud-breeder and show-exhibitor has been obtained and complete records of daily feed intakes, heart-girth increases and weight increases are being compiled. Information obtained from this work will be of considerable value to other stud-masters in the preparation of their bulls.

TROPICAL COAST INVESTIGATIONS.

During the year an officer was stationed at the Bureau of Tropical Agriculture at South Johnstone in order to assist in the beef cattle work being undertaken there. The extension of the grazing programme to Utchee Creek will considerably increase the amount of weighing to be undertaken. This officer also makes periodic visits to Ayr, where beef steers are being fattened on irrigated pastures. Apart from routine duties on the property, the officer will make observations on the grazing habits of cattle in the tropical environment.

SANTA GERTRUDIS CATTLE.

The introduction of a Santa Gertrudis stud herd to Queensland in June of this year by a joint American-Australian Company is an important landmark in the development of the Queensland beef cattle industry. This breed of cattle was developed on the King Ranch in Texas from original crosses between Shorthorn and Brahman cattle. The breed is approximately three-eighths Brahman and five-eighths Shorthorn. In developing the breed, an attempt was made to retain the beef qualities and conformation of the Shorthorn and the foraging ability and heat-tolerance of the Brahman. The breed was accepted as a pure breed in U.S.A. only in 1940. Except for one bull introduced in 1933, no Santa Gertrudis have previously been imported into Australia.

The part which the Santa Gertrudis breed might play in the development of the Queensland beef industry is at present uncertain, but because these cattle are an established breed capable of producing a desirable carcase, they can be used much more efficiently in the normal station-breeding programme than the purebred Brahman. If the breed proves a success in tropical Queensland, it will mean a considerable saving of time, as the production of uniform herds by the use of Brahman crosses would take many years.

MINERAL DEFICIENCIES.

A trial was carried out in the Kin Kin area to demonstrate the correction of mineral deficiencies, as it is thought that on many farms in the area both phosphorus and copper deficiencies exist. The production per cow in this area is amongst the lowest in Queensland, and the condition of the stock is in keeping with the milk and butterfat yield. During 1950, when this demonstration was commenced, many instances of emaciation and heavy losses of cows and calves were observed. The methods of control used in the demonstration were as follows.

(1) Provision of fodder crops or pasture for a longer period of the year than is usual in the district and to establish regular winter and summer cropping procedures.

(2) Correction of low phosphorus status of the livestock by the use of—

(*a*) phosphorus supplements fed to the stock directly, and (*b*) superphosphate on the cultivated crops.

(3) Pasture renovation and efforts to control and eradicate blady and mat grasses.

(4) Correction of copper deficiency, which occurs in the stock especially during months of high rainfall and rapid growth of pasture.

Although this demonstration was carried out during the adverse season of 1951, a considerable lift in production was experienced during the periods of crop grazing and the condition of the stock was quite good although on surrounding farms many animals died from

malnutrition. In Fig. 1, the production of this herd is compared with that of the Pomona herd recording group, which comprises 20 herds, including several on farms in more favoured areas with relatively good paspalum pasture and on which concentrate feeding is practised.

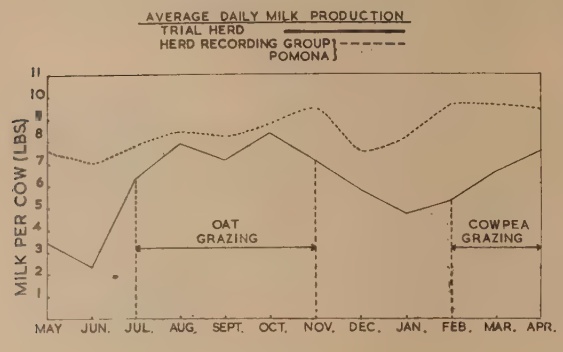


Fig. 1.

GRAPH SHOWING HOW THE PROVISION OF GRAZING CROPS RAISED MILK PRODUCTION OF A HERD ON A FARM IN THE KIN KIN AREA ON WHICH VARIOUS DEFICIENCIES ARE SUSPECTED.

The occurrence of copper deficiency has been established on the South Coast and arrangements to carry out a demonstration on the use of copper supplements and their effect on two farms in this area are now in hand. This area of copper-deficient country is quite extensive and represents a considerable proportion of the milk-supply farms in the South Coast district.

In addition to demonstration work on this problem under the Commonwealth Dairy Industry Efficiency Scheme, work has continued on a property in the Mooloolah district in co-operation with the Division of Plant Industry and Yeerongpilly Animal Health Station. A scale has been installed, and cattle grazed in paddocks treated with various fertilizer mixtures are being weighed regularly. Liver biopsies and blood samples are taken at quarterly intervals for laboratory analysis. An extension of work on this property is now contemplated.

It is thought that low phosphate status of the soil may be an important cause of retarded growth rates and lowered fertility in beef cattle in some parts of Central and North Queensland. Field officers in Central Queensland are now carrying out initial surveys of the blood-phosphate level of cattle on these areas in an attempt to define the possible deficient areas.

Other work on phosphate deficiency is being carried out with dairy cattle in the Gympie district with finance from the Commonwealth Dairy Industry Efficiency Grant.

CONCENTRATE-FEEDING DEMONSTRATIONS.

Feeding demonstrations with various concentrate mixtures were continued during the year with money made available under the Commonwealth Dairy Industry Efficiency Scheme. The increase in grain prices and the concurrent shortages of high-protein meals due to the drought made the operation of these demonstrations difficult. However, the information yielded will be of considerable value.

The demonstrations are being conducted in six different districts in the State; no additional districts were included due to the cost of feed.

The demonstrations were designed to show the effect of feeding small quantities of concentrate on milk and butterfat production. In some herds two rates of feeding the one concentrate mixture were compared, while in other herds attempts were made to demonstrate the effect of two concentrate mixtures of different protein levels when fed at the same rate. In most herds the cows were grouped according to production and fed by two methods, but in some a control group was included.

Subsequent to January 1952 the feeding rates were changed and four rates of feeding the concentrate mixture as well as three levels of protein were compared. This was carried out in order to obtain results with a greater coverage and application. By June 1953 sufficient data should be available to give a complete evaluation of the practicability of these various methods of feeding concentrates. The rates of feeding for the period January 1951 to January 1952 were the same as those for the previous 12 months, so each cow completed two lactations under the same system of feeding. The two rates of feeding concentrate which were compared were 1 lb. of concentrate per 3 lb. of milk, and 1 lb. of concentrate per 6 lb. of milk, the initial 10 lb. of milk not being taken into consideration. The higher rates of feeding showed an increase over the low rates but the extra milk production was uneconomical.

The comparison of two levels of protein—namely 10% crude protein and 20% crude protein—showed that there was no significant lift in production from feeding at the higher level in the concentrate mixture as compared with the lower level. This result was obtained during the wet summer months, the drier winter months, and the drought of 1951. This indicates that probably the need of dairy cattle in this State is for additional energy food rather than additional protein and raises the question whether so much emphasis should be placed on the provision of additional protein rather than provision of additional roughage. The drought demonstrated the effect of feeding concentrates on stock, the supplemented cattle maintaining production for longer periods than the non-supplemented and being in a position to regain their full productivity quickly when the drought broke. The demonstration also showed that those farmers who had reserves of roughages were able to maintain near-normal levels of production throughout the drought.

Since, under the conditions existing on the demonstration farms concerned, the grain supplements appear to be equally as efficient in boosting milk production as the higher protein mixtures, the problem of supplementary feeding of dairy cattle may be less complicated, as the dairy-farmer will not have to compete with pig- and poultry-raisers for the higher protein meals: he may be able to rely on the more readily available grain mixtures.

DEPRESSED BUTTERFAT YIELDS.

Following favourable results obtained in the previous year, co-operation was given to the Dairy Research Branch in carrying out two trials in the Beaudesert area on the effect of feeding cereal hay on the butterfat percentage of milk. On one property where inferior oaten hay was fed to cows at the rate of approximately 7 lb. per day a good response was obtained with respect to both percentage of butterfat and total milk yield. Results on the second farm were inconclusive. Further trials on a more extensive scale are planned for the coming year.

CALF-FEEDING DEMONSTRATIONS.

The calf-rearing trials were continued and extended during the year. They were designed chiefly to study methods of rearing calves on limited amounts of wholemilk and on limited amounts of skim-milk. The minimum amount of wholemilk on which calves have been reared by the Branch up to the present is 15 gallons per calf. However, calves reared on this small amount of milk appear to be more susceptible to internal parasites and infectious diseases than those reared with a more liberal allowance of milk. This calls for greater care and attention to hygiene.

There was no appreciable difference in weight gains of calves reared on 40, 25, 20, and 15 gallons of wholemilk, all calves maintaining weight gains comparable with those regarded as standard for American calves of the same breed (Ragsdale scale). The average cost of rearing a calf on limited wholemilk is between £10 and £11, as compared with £7 for skim-milk. The major portion of these costs is due to the concentrate supplements used, which amount to about 75% of the total cost.

During the drought the older calves, from 10 to 14 months of age, were grazed with the cows and Fig. 2 gives an interesting study of the effect that seasonal conditions have on the growth rate of young heifers. This emphasises the need for an adequate post-weaning plane of nutrition.

Fig. 2.

Graph Showing the Effect of Season on the Growth Rate of Young Dairy Heifers.

In a further two trials, calves were reared on skim-milk for periods varying from six to 12 weeks. The calves were fed on wholemilk for 7-14 days prior to changing over to separated milk. This early feeding with wholemilk is quite important and has a considerable effect on the growth rate of the calf during the period of feeding skim-milk. It appears undesirable to reduce the time for feeding skim-milk below four weeks, which means that the calf is fed milk for six weeks.

Another trial has been commenced to compare the relative efficiencies of feeding gruel and dry meal. To date, about 12 calves have been reared in this trial and although this is too few to give any correct assessment, there is so far no indication of any appreciable difference in their growth rates.

INFERTILITY.

Temporary infertility and sterility among dairy cattle in the most intensively farmed dairying districts of the State are of great economic importance to the industry. They prevent farmers from planning the calvings of their herds with any degree of certainty and result in considerable loss of milk and butterfat each year. This problem of infertility is not confined to Queensland, and with the idea of prosecuting an Australia-wide survey into the incidence and causes of sterility, a Committee representing the various States and the Commonwealth has formulated a programme of enquiry. It was hoped to recruit a specialist officer to carry out the recommendation of the Committee. Although it was not possible to do this during the year, a considerable amount of information is being obtained by field officers in the course of their normal duties. Routine examination of female genitalia from infertile cows sent to slaughter from problem herds is now being carried out at Yeerongpilly Animal Health Station. Investigations in individual herds during the year have emphasised the fact that problems of infertility are frequently much greater in herds where *Brucella* infection exists, though the immediate cause of the infertility may often be a secondary infection with organisms other than *Brucella*.

An attempt to control trichomoniasis infection in one dairy herd by the use of artificial insemination was successful. All cows in the herd calved normally after being inseminated with semen from a non-infected bull. Two cows and a bull were sold for slaughter after trichomonads had been demonstrated in their genitalia. So far as is known, the herd is now free from infection and normal service by the bull has been resumed with good results.

KAIRI REGIONAL EXPERIMENT STATION.

A herd of approximately 70 head of cattle was maintained on the station during the year. Twenty-one of these were cows in milk and the remainder growing stock and experimental steers. For the 12 months ended September 30th, 1951, the average production was 199 lb. butterfat for an average lactation period of 253 days. The Tableland average for the same period was 186 lb.

A weighbridge suitable for weighing adult cattle was installed, and all cattle, including calves, are now weighed regularly as part of the routine management of the farm.

The top bull in the herd was sold to a local dairy-farmer with the option of repurchase in two years' time when his heifers will have completed their first lactation. He was replaced by a bull calf. In this way the policy of proving a bull for more extensive use in the herd has been carried on.

At the beginning of the season the herd was divided into two matched groups with the intention of testing the effect of feeding a low-protein roughage during the wet season when only lush pasture was available. Owing to the absence of a normal wet season the pasture at no stage reached a condition which could be termed lush and results from this trial were inconclusive.

Three selected cows were fed with crushed grain treated with commercial BHC in order to ascertain the effect of the ingestion of treated grain on milk flavour. Amounts of up to 6 lb. of grain failed to cause any detectable taint in milk even when fed over a period of some weeks. These results were not in accordance with overseas reports, and it is proposed to repeat the work using a larger number of animals.

Fencing and water improvements on the Station enabled a start to be made with some A.I.S.-steer-raising work. The first batch of 12 steers were put on a "skim-milk-pasture" diet. Seasonal conditions adversely affected the pastures available to the calves. In addition, an outbreak of coccidiosis was experienced. Results suffered accordingly. The average weight of nine calves that survived to weaning age (5 months) was 174 lb. The nine calves consumed between them 44 gal. of wholemilk and 1,989 gal. of skim-milk.

Trials with two types of nipple feeders, as an alternative to feeding from the bucket, were carried out with the heifer calves born on the station. These trials failed to show any advantage for the nipple feeders, and as the nipples entail more careful washing and sterilization, this method of calf-raising cannot be recommended for

general use by the dairy-farmer. Teat-feeding has the definite advantage of controlling the sucking habit which is developed by bucket-fed calves: this could be of considerable importance in disease prevention.

Three sets of identical twins are now on the station. Two sets will be in production during the coming season but the third set will not calve until the spring of 1953.

The disease position of the herd has been satisfactory throughout the year, though bloat and coccidiosis could be of considerable importance in determining future herd-management policies.

A maize-pasture rotation programme has been established with lucerne and mixed lucerne and Rhodes grass pastures as the pasture side of the rotation. This type of pasture makes excellent milk-producing fodder, but under seasonal conditions more favourable to lucerne growth than grass growth, some difficulty has been experienced with bloat. Bloating has usually occurred two to three days after the cattle were placed in a new field and it has been suggested that changes in the rumenal flora brought about after a period of 48 hours on lush legume grazing may predispose cows to bloat. Attempts to prevent bloating by feeding dry roughage in the form of hay or by grazing mature Rhodes grass prior to placing cattle on the predominately lucerne pasture have not been entirely successful. Detailed information on all aspects of each individual case is being recorded in the hope that over a period of time sufficient material will be available to make it possible to predict conditions under which bloating will occur.

Some cases of coccidosis in calves raised on a rotational-grazing schedule were diagnosed by officers of the Veterinary Services Branch. It is apparent that close attention will have to be given to methods of preventing this disease when calf-rearing is undertaken in future.

DAIRY FARM COMPETITION.

Entries for the 1951-52 competition were much greater than in any previous year and some difficulty was experienced in making sufficient staff available for the spring judging. Drought conditions during the spring and summer forced the withdrawal of many competitors before the autumn judging. The interest created by the competition has increased each year and attendances at field days on winning farms in all districts during the past year were very satisfactory.

CATTLE STATISTICS.

(Source: Queensland Government Statistician.)

BEEF CATTLE (as at March 31).

Year.	Number.
Average—	
1936 to 1940	6,047,726
1947	4,613,163
1948	4,592,896
1949	4,568,966
1950	4,872,018
1951	5,293,350
1952	5,137,500

DAIRY CATTLE (as at March 31).

Year.	Number.
Average—	
1936 to 1940	997,484
1947	1,332,122
1948	1,382,564
1949	1,422,831
1950	1,432,760
1951	1,440,198
1952	1,296,400

PIG BRANCH.

Mr. F. Bostock, Officer in Charge.

The following gives an indication of the work carried out by officers of the Branch during the year:—

Farm visits	2,660
Pig sales attended ..	86
Meetings attended ..	41
Field days	17
Bacon factory visits ..	109
Shows attended	28
Demonstrations given ..	28
Lectures given	23
Regional Experiment Station visits	79

PRODUCTION.

Production figures for the year reveal a decrease of approximately 20% in the number of pigs slaughtered. This can be attributed mainly to the drought conditions experienced and to the shortage and high price of cereal grains. The continued short supply of animal-protein feedstuffs, fencing wire, piping and certain types of building materials was a factor in the decrease.

The quality of the pigs forwarded to market was generally very fair. The year, unlike previous years, saw a marked decrease in the number of overfat pigs coming forward to bacon factories, mainly, it is thought because of the drought coupled with high prices and shortage of grains forcing unfinished and lightweight pigs onto the market.

The seriousness of this problem of the overfat pig should not be forgotten. Marketing conditions remain the same, and except for the area controlled by the Northern Pig Marketing Board, farmers receive the same return, weight for weight, for an overfat pig as for one with the most desirable proportion of fat to lean. A system of differential payment according to grade appears to provide the incentive to market pigs before they become overfat. The collection of technical data for use in framing suitable grade standards has been commenced.

The contract price for pigmeats for export to the United Kingdom is 1s. 9½d. per lb. to the producer for first-quality baconer pigs (this price is substantially below the price asked for by the industry), but as a result of the shortage of pigs, the local price is at present 2s. 4d. per lb. and the export of pig carcases to the United Kingdom has been considerably reduced. Another factor now militating against the export of pigmeats to the United Kingdom is that as from 2nd May, 1952, frozen pork, cured bacon and ham, canned bacon and ham and salted pork may be shipped on a trader-to-trader basis to all destinations other than the United Kingdom.

For the fifth successive year, the Australian Meat Board in association with the Department of Agriculture and Stock and with the co-operation of all sections of the industry conducted chilled baconer carcase competitions on a district basis. Judging was carried out in conjunction with field days arranged at Mareeba, Rockhampton, Toowoomba and Brisbane. The championship was awarded to a pig of the Large White breed bred in the Rockhampton area. The carcase, of 134 lb. dressed weight, secured 85% of the maximum points possible, was well proportioned and of good type and scored well in all points. Entries which complied with the competition conditions had an average score of 70.63%, while the scores secured by 1st, 2nd and 3rd prize winners in each district were all above 80%.

That these competitions are maintaining their popularity was borne out by the fact that 172 entries were received; of these 140 complied with the competition conditions. This represents an increase of 12 carcases judged and 13 entries received. There can be little doubt that had seasonal conditions been more favourable the number of carcases presented for judging would have been greater still.

The average of each section at judging over the five-year period is given in Table 1, from which it will be noted that there has been an overall improvement of approximately 10% in carcase quality.

STUD PIG RAISING.

Reports from the field staff indicated that there was generally a keen demand for stud pigs in most parts of the State.

Selection of breeding stock on appearance, though of great value when made by a competent judge, has well-known limitations. Progeny testing to overcome such limitations has been continued at Kairi Regional Experiment Station and the experience gained will be valuable in relation to the operation of a pig-testing station in the future. Tests are designed to give information on such features as litter size, early-maturing qualities, economy of liveweight gain and carcase quality.

CARCASE COMPETITIONS.

Cured baconer carcase competitions were again popular with country show societies and are proving a very useful menas of demonstrating to producers the type of carcase required by the trade. Entries were not so numerous as in the previous year but this weaker support is attributed mainly to the drought conditions experienced in all districts.

TABLE 1.

CURED BACONER CARCASE COMPETITIONS. AVERAGE POINTS FOR EACH SECTION OF JUDGING.

	Possible Points.	1948.		1949.		1950.		1951.		1952.	
		Average Points Obtained.	Percentage of Possible Points.	Average Points Obtained.	Percentage of Possible Points.	Average Points Obtained.	Percentage of Possible Points.	Average Points Obtained.	Percentage of Possible Points.	Average Points Obtained.	Percentage of Possible Points.
By Inspection—											
Hams	8	5·604	70·050	6·27	78·40	6·097	76·213	6·44	80·52	6·286	78·571
Shoulders	7	5·562	78·029	5·92	84·57	5·849	83·564	5·92	84·60	5·947	84·959
Streak	12	6·764	56·367	5·57	46·40	7·766	64·724	7·41	61·79	6·982	58·185
By Measurement—											
Eye Muscle	28	11·775	58·875	18·04	64·42	14·262	50·936	20·15	71·96	19·114	68·265
Backfat Thickness ..	20	15·489	77·445	15·26	76·30	14·572	72·864	15·45	77·23	14·729	73·643
Body Length	20	12·500	44·643	13·06	65·30	13·388	66·941	12·98	64·92	14·814	74·072
Leg Length	5	3·111	62·220	3·02	60·40	3·281	65·631	3·21	64·22	2·757	55·142
Total	100	60·805		67·97		65·218		71·57		70·629	

RESEARCH.

Progeny Testing.—At Kairi Regional Experimental Station the progeny-testing programme in operation is providing an aid to the selection of breeding stock for essential commercial characters. Table 2 presents the performances of two sows involved in the "diallel crossing" programme, in which genetic differences are determined under a system in which males are bred alternately to the same females and comparisons made of the average merit of the two sets of progeny.

TABLE 2.

COMPLETED RECORDS OF TWO TEST SOWS.

	Sow No 16.	Sow No. 18.
Own Performance (Mean of two litter records)—		
Number of pigs weaned ..	6	9
Total weaning weight (lb.) ..	173	220
Progeny Performance (Mean performance of two test litters per sow)—		
Growth (lb. per day)	1·04	1·03
Economy of gain (lb. feed per lb. gain)	4·09	3·98
Carcase quality ..	Standard	.. ..
Dressed weight (lb.) ..	153	152 154
Body length (mm.) ..	825	767 748
Eye muscle (mm.) ..	54	47 47
Back fat (mm.) ..	21	38 38
Leg length (mm.) ..	569	568 564
Total marks ..	100	55 49

The progeny of these sows are obviously "over mature" at the optimum commercial carcase weight for baconers which is stipulated under the testing programme. As a result, both selection and introduction are now aimed at the development of a later-maturing type of Tamworth which would not be over-finished at this weight.

Carcase Quality.—A general approach has been made to carcase-quality problems in bacon pigs. Firstly, it was desirable that accurate standards by which carcase quality can be measured should be determined. A study has been made of the application to the Queensland environment of the standards used in the Hammond appraisal system. For some characters it appears that certain adjustments might be made, and subsequent analyses of appraisals from some other States are tending to confirm this view.

The use of the Hammond appraisal system is of course limited to experimental carcase evaluation or competition judging. This is because the appraisal requires considerable time and involves a non-commercial cut. For commercial work it has become necessary to formulate a grading system that will overcome these difficulties.

It seems obvious that, in the absence of a system of grading with differential payments according to quality, there can be no financial incentive for the producer to market quality carcases. On the other hand, any grading system that may be introduced must be based on accurate and fair standards. To anticipate this problem, carcase data from a large number of commercial pigs are being collected. Grade is being defined within the limit of three measurements—shoulder fat, loin fat and body length.

By studying the distribution of these characters for selected weight ranges, suitable standards can be fixed for whatever grade may be required, and it will be possible to predict approximately what percentage of pigs on present standards will fall into any such grading categories.

Plane of Nutrition and Carcase Quality.—Assuming that through the introduction of grading there will be an increased incentive to produce high-grade pigs, the branch has been investigating environmental means by which improved quality can be attained. Overseas research into the effect of the plane of nutrition upon carcase development has suggested that by slowing down the growth rate of bacon pigs in the finishing-off stages an appreciable improvement may be made. Field methods of achieving this and their effectiveness have been the subject of investigation at Kairi Regional Experiment Station and H.M. State Farm, Palen Creek.

The effect on carcase quality of the inclusion of the following levels of lucerne chaff was studied:—

Liveweight.	Substitution of Grain by Lucerne Chaff.
Lb.	%
100–135 ..	5
135–160 ..	10
160–200 ..	15

The use of lucerne chaff, by effecting a decrease in overall digestibility of the ration, reduced growth rate by approximately 12%, and there was a resultant improvement in carcase quality (for example, a reduction of 9% in mean backfat thickness at comparable carcase weight). One of the most promising sidelights of this trial was the effectiveness of the design in reducing experimental error through the use of individual feeding methods and careful selection of the experimental material.

Photographs showing the type of improvement in quality which can be effected are shown in Plate 5, page 28. Experimental pigs Nos. 3 and 4 are litter mates; No. 3 is a control pig and No. 4 received the lucerne-chaff-substituted ration.

A.P.F. Supplements and Antibiotics.—An investigation of the supplementary value of condensed whale solubles to an all-vegetable ration for growing pigs was made. Results have shown that although there is evidence that condensed whale solubles contains the Animal Protein Factor, the all-vegetable ration supplemented at the 8% level proved greatly inferior to a recommended ration which uses meatmeal as a protein concentrate and source of A.P.F. (See Fig. 1).

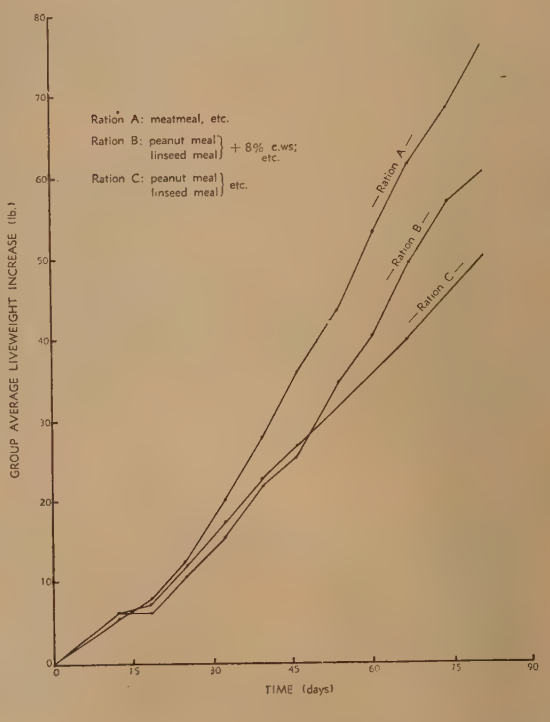


Fig. 1.

GRAPH SHOWING THAT CONDENSED WHALE SOLUBLES CAN REPLACE SOME OF THE MEATMEAL IN PIG RATIONS.

Some experience in the nutritional use of antibiotics has been gained in an exploratory feeding trial carried out at Yeerongpilly Animal Health Station. Using a streptomycin-terramycin preparation, evidence was obtained which suggested that reported phenomenal growth increases may only occur in special cases or conditions of management and that their field application requires further investigation.

GENERAL.

The stud herd of Tamworth pigs at Kairi Regional Experiment Station has been maintained and progeny testing continued throughout the year. At Hermitage Regional Experiment Station, fencing of the yards and paddocks for the pig section is progressing and it is hoped to establish a Berkshire stud at this farm during the coming year.

The brucellosis-testing scheme introduced in 1950 in conjunction with the Veterinary Services Branch provides for the testing of stud herds until such time as they have passed two consecutive tests without any positive reactors being found and for an annual re-test. Sixty-two herds have been issued with appropriate certificates and placed on the list published in the *Queensland Agricultural Journal* each month; a further 15 herds have entered the scheme but have still to complete the required tests.

The health of stock has been generally satisfactory, but Salmonella infection continues to be responsible for moderate losses on many properties. In the Warwick area and at one stud in the Moreton area, trouble was experienced with sows not producing milk after farrowing. This condition is thought to be of a nutritional nature, but the actual cause has not been determined despite continued investigations.

DISTRICT REPORTS.

North Queensland.—Due to adverse seasonal conditions with below-average rainfall, the year has not been a bountiful one for pig-raisers, but very few producers disposed of breeders. This is considered to be due to a better understanding of feeding problems and appropriate use of feed on hand and available by purchase. A natural consequence of the season was a lower average weight for pigs marketed, though the total number slaughtered was not greatly below that for the previous year.

Enquiries regarding pig-raising were received from the Gulf country, but while pigs could possibly be grown there successfully, enquirers have been advised that the present shortage of protein supplements and transport costs of pigs to Mareeba would make pig-raising in that area a hazardous undertaking.

Grading standards were evolved and submitted to the North Queensland Pig Marketing Board. The Board has expressed satisfaction with the way in which the grading standards have worked in practice. All porkers and baconers are paid for by the Board on grade.

In spite of shortages of materials, many repairs to existing accommodation have been made. New construction work has been limited but at present there are several piggeries being built according to Departmental plans and under the general supervision of the Adviser. A number of farmers are collecting materials in readiness to rebuild.

Further work on breed type and grading has helped to maintain a high standard of pigs submitted for slaughter. Though farmers in general will not pay the prices asked for purebred stock, the type of breeders maintained is generally good.

During farm visits most attention was again concentrated on feeding, particularly as affected by the pronounced shortage of protein supplements. Farmers in general are now aware of the value of meatmeal and pasture in replacing diminished supplies of separated milk. Encouragement has been given to the greater use of root crops for the same purpose and for replacing expensive grain in the ration.

The manufacture of meatmeal and bonemeal at Mareeba during the past six months has been of considerable value to the industry, though the amount has been small. The possibilities of drying brewer's grains are being investigated.

Central Queensland.—In keeping with the general drought conditions prevailing throughout the State, the year has been a very trying one for pig producers. In the main, the first seven months were very dry, and during November-December, hot, dry winds parched crops and pastures. The light rain that fell during this period was of little benefit, but reasonably good falls were experienced from January onwards.

Production was high during the first half of 1951, but at the commencement of 1952 had fallen to almost half and by January was halved again due to the shortage of milk, grain and green crops. This further influenced farmers to market lightweight pigs and at the same time dispose of their breeding stock. Production during the past few months has improved only slightly and it is anticipated that some time will elapse before it again reaches the normal level.

Another factor influencing production during the dry period was the rationing of meatmeal and the dairying industry's requirements of this concentrate, which caused an acute shortage for pig-feeding purposes. Meatmeal is still in limited supply, but the shortage is being overcome to some extent, on certain properties, by grazing pigs on green-crops specially grown for the purpose.

The pigs marketed were mainly unfinished, very few being in good to prime condition. These were produced by growers who practice grain-storage for emergencies. During the dry period producers generally realised the importance played by green-feed in the ration of both growing stock and breeders. Litters were poor in numbers and vigour and in some instances sows failed to breed until their ration was fortified with a vitamin-A supplement.

Producers realise the value of marketing their grain through the pig and raising pigs in conjunction with dairying and are anxious to again build up their breeding stock. Greater interest in improving quality is evidenced by the number of stud pigs being purchased.

A recent inspection of one property, on which feeding trouble in the previous year had been thought to be due to the seed pods of phasemy bean, disclosed that with the abundance of other green feed available, the phasemy bean had not been eaten.

Burnett.—The seasonal conditions experienced were the worst on record. The drought which commenced in February continued for nine months of the period under review and did not break in the South Burnett area until the middle of March. Since then, conditions, except for some frosts, have been excellent for plant growth.

Owing to the adverse weather conditions feed was in very short supply. Grain, which forms the major portion of the pig's diet in this district, was inadequate at all periods of the year. This was due partly to the fact that many farmers sold maize in June at high prices, anticipating that wheat would be available in sufficient quantities and at a much lower price. The State Wheat Board was unable to meet the increasing demands, so much so, that during recent months supplies were sufficient for only one to three bags of wheat per month to each producer. Farmers became concerned and they either disposed of all their pigs or considerably reduced the number of breeding sows. Many pigs as a direct result were marketed in an unfinished condition.

Ideal weather conditions during the past few months have completely changed the outlook. Harvesting of grain sorghum has just commenced and increased quantities of this stock-food will soon be available. Owing to the uncertain market, many farmers are contemplating disposing of the crop through the pig. Maize crops are in the late stage of maturity and abundant supplies of forage crops are to be seen everywhere throughout the area.

Protein foods were in very short supply, but owing to the good grazing oats available to dairy stock during the early winter, milk production has increased considerably, in many instances up to 100 per cent.

Darling Downs.—The season generally was bad, due to drought conditions, but recent rains have given promise of a good winter.

Grain supplies were very limited and expensive, while protein meals were never equal to the demand. An effort to relieve the shortage of protein meals has been made by the entry of the Darling Downs Co-operative Bacon Association into the field of meatmeal manufacture, and it is hoped that increased supplies from this source will be available in the near future. Any improvement in the protein-supplement supply would be reflected in increased pig production. Production has shown a decline owing to the shortage of feed, but the demand is still strong and prices obtained at auction are reaching new high levels. Some stud breeders were left with a small surplus of boars, this being due, no doubt, to the drought. Berkshire breeders were, how-

ever, able to dispose of all available stock because of a large consignment of Berkshire boars despatched overseas. Some breeders of stud pigs contend that the margin of profit on stud pigs over commercial pigs is not wide enough.

A definite improvement in the type of pig marketed throughout the area has been noted. The absence of large numbers of overfat pigs is thought to be due, however, largely to feed shortage and drought conditions.

Diseases of pigs called for a good deal of attention in this area, especially under conditions of poor housing and sanitation. Considerable trouble was experienced because of vitamin-A deficiency.

Warwick.—This area was staffed for the first time in 1951 and it can be said with confidence that the new appointment has been well received by pig producers in the area. This is borne out by the large number of enquiries received for information relating to all aspects of pig-raising and for personal visits to farms in the area.

There has been a continuing incidence of disease in pigs, and in co-operation with the Veterinary Services Branch a great deal of time has been spent in combating the conditions responsible for initiating outbreaks. However, until the full economic implications of good husbandry are better understood by producers, it would appear difficult to achieve all that is desirable.

Every endeavour is being made to reach the greatest possible number of farmers by means of personal contact, field days and lectures at suitable centres. Special attention was given to the Warwick Show. By personal contact entries were doubled and the Show Committee was appreciative of the results obtained. Farmers also were greatly impressed by the improved showing and by the success and quality of stud pigs compared with commercial types.

The year was a difficult one owing to the drought, high cost of fodder and often low returns for pigs, but progress has been made, particularly in establishing wider contacts and better relations with farmers.

Moreton.—Weather conditions followed the general State pattern for the first half of the year. Early in 1952 freak storms provided temporary relief in scattered areas, enabling farmers to plant prepared ground with fodder crops. Beneficial rains and mild weather were experienced in the last quarter and response by crops was good.

The area includes the metropolitan district, in which the feeding of kitchen scraps, hotel refuse, &c. is firmly established on suburban farms. This type of farming is largely controlled by the Brisbane City Council, which issues permits to operate. The Council maintains close liaison with the Branch, which carries out the necessary inspections and submits reports with respect to the suitability of sites, management, hygiene, &c.

Inspections are also made at the request of the District Contract Board, which deals with all contracts for the handling of kitchen refuse from defence establishments. Contractors are required to be properly equipped for the handling of this type of food, and apart from the initial reports subsequent check inspections are made during the contract period. It is pleasing to note that feeders of this class of food are showing interest in steam-cooking. One large steam-cooking plant has been installed and several more are contemplated.

Close liaison has been maintained with the four major bacon factories situated in the area, where the bulk of the State's production of baconers is treated.

The decline in pig production which was anticipated due to the fact that Brisbane and Ipswich are situated in this area, and because of the change-over by dairy farmers to wholemilk supplies, was arrested by the improved price offering for pigmeats.

Sarcoptic mange was widespread in the Moreton area and Glasser's disease was particularly prevalent on farms where the purchase of store pigs is practised. In co-operation with the Veterinary Services Branch, sulphamezathine has been administered with good results in the control of outbreaks of this disease.

PIG STATISTICS (as at 31st March).

Year.	Number.
Average, 1936–40	319,069
1947	340,150
1948	378,102
1949	407,322
1950	391,836
1951	374,991

POULTRY BRANCH.

Mr. P. Rumball, Officer in Charge.

The year under review was one of the most difficult the poultry industry experienced for some years past. Scarcity of feed, sharp rises in feed costs and a fall in the market value for poultry flesh have caused a serious decline in egg production and in the number of persons engaging in this industry.

There was some evidence of a build-up in poultry flocks during the first half of 1951, and with the buoyant market in poultry meats it was anticipated that there would be active competition between these two phases of the industry. In August a feed shortage developed and by September many birds in the flush of production were being sent to the abattoirs. Feed costs rose sharply towards the end of September, and although the feed situation was somewhat alleviated at that time by the introduction of feed wheat from South Australia, reduction in laying flocks nevertheless took place.

During the late winter, spring and early summer, poultry-raisers have on their properties, in addition to their adult birds, young stock for replacement purposes. The excellent prices being paid by poultry-slaughtering establishments up to the end of January encouraged the raising of a greater number of cockerels by commercial egg-producers than in previous years, with the consequence that the farmer was faced with the problem of using the available food supply to the best purpose. As the first-year production of the hen is the most profitable, farmers considered that it was better to dispose of laying fowls and conserve all available food for raising pullets to maturity and cockerels to a marketable age.

The sharp rise that took place in the disposal of hens, commencing in August, is evident from Fig. 1. The graph indicates very clearly that from August to January (when the feed requirements of young stock are greatest) there was an increase in the disposal of hens in comparison with the previous two years. During those two years, an average of approximately 250,000 hens was slaughtered from July to January, whereas in 1951-52 nearly 430,000 were killed.

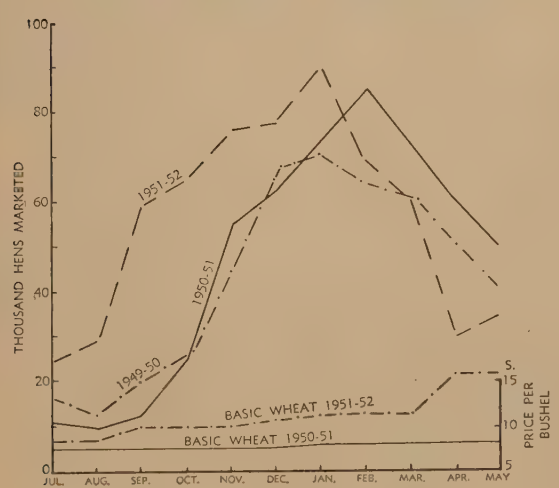


Fig. 1.

MONTHLY INTAKE OF HENS BY PROCESSORS IN THE BRISBANE AREA.

From December until May, merchants receiving quotas of grain were forced to place farmers upon a strict quota, and it was not until the later part of May that one of the larger distributors of poultry foods found it possible to liberalise the quota. It was only in June that grain became freely available, and this was probably due in some measure to the depletion of flocks which had taken place in the preceding eight or nine months.

In addition to grain, all forms of protein-rich foods have been in extremely short supply, with the consequence that the crude-protein content of poultry mashes in some instances has been reduced to 14%. This in itself is calculated to have contributed to a much lower output of eggs.

EGG PRODUCTION.

In southern Queensland, production of eggs as measured by the intake of the [South Queensland] Egg Marketing Board declined by about 21%.

In Central Queensland the decline in production as measured by the board operating in that area was approximately 45%. The feed shortage in this area was even more acute than in southern Queensland.

The Branch Adviser in North Queensland estimates that in that portion of the State there was a decline in egg production of 10%.

POULTRY MEAT PRODUCTION.

This side of poultry-raising, which seemed to show promise of assuming extensive economic importance in previous years and also in the early portion of the year under review, received a serious setback in February due to the low values for chicken- and hen-meats ruling in Great Britain. While the market was buoyant in Great Britain, processors of poultry meats were able to pay farmers as much as 2s. 9d. per lb. live-weight for chicken meat and 1s. 9d. for hen meat. They are now only able to pay 1s. 9d. and 1s. 4d. respectively. Duck meats have fallen only from 2s. to 1s. 9d. and processors have so far been able to maintain turkeys at 2s. 9d.

Fig. 2 shows that the impact of the feed shortage on this phase of the industry caused an earlier disposal of birds. It is calculated that the disposal of birds at an earlier age than in previous years was responsible for a consequent reduction in weight of approximately ½ lb. per bird. In order to counter the tendency on the part of the farmer to market immature birds owing to the shortage of feed, processors paid a higher price per pound for chickens weighing over 3½ lb. than for birds less than 3½ lb. The term "chicken" as used by processors includes young male birds and pullets that had not laid, and although no actual figures are available with respect to the number of potential layers that were sold, it is known that large numbers of pullets were sold for slaughtering purposes.

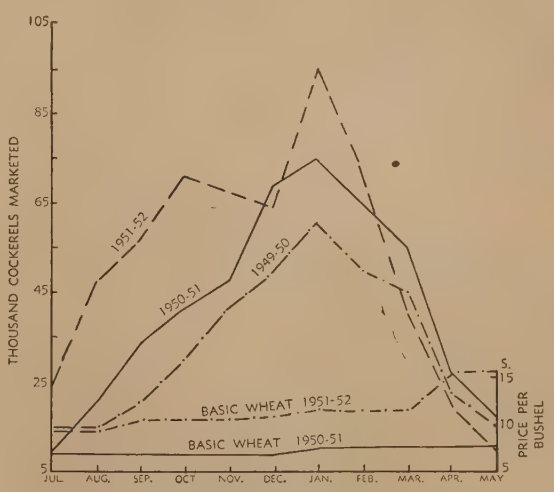


Fig. 2.

MONTHLY INTAKE OF COCKERELS BY PROCESSORS IN THE BRISBANE AREA.

Table 1 gives the total number of poultry slaughtered in slaughtering establishments in Brisbane over the past three years, and Table 2 the export of dressed poultry.

TABLE 1.

TOTAL BIRDS SLAUGHTERED—BRISBANE.

1949–50.	1950–51.	1951–52.
1,299,445	1,158,920	1,307,095

TABLE 2.

EXPORT OF DRESSED POULTRY.

—	1949–50.	1950–51.	1951–52.
	Lb.	Lb.	Lb.
Boiler hen	1,684,480	1,400,000	1,697,920
Chicken	1,238,720	1,113,280	1,576,960
Duck	1,025,920	425,600	349,440
Turkey	67,200	69,440	42,560
Total	4,016,320	3,008,320	3,666,880

POULTRY STOCK SUPPLIERS.

Several farmers registered as Stock Suppliers in the previous year have discontinued the business for which they were registered. Twenty additional registrations were made, however, increasing registrations beyond the previous year's figures. It is pleasing to be able to report a further reduction in the incidence of pullorum disease in the flocks of Stock Suppliers. There are now over 120 flocks in which the incidence of this disease is less than 2% (100 in 1950-51), and of these over 50 had less than 1% (40 in 1950-51).

Table 3 sets out for the past three years the numbers of registrations and the business for which registrations were made.

TABLE 3.

REGISTERED STOCK SUPPLIERS.

Business.	1950.	1951.	1952.
Hatching chickens for sale..	188	176	179
Supplying fowl eggs for hatching	46	47	47
Poultry dealer	4	4	7

CHICK SEXING.

Twenty-five persons were licensed for the purpose of determining the sex of day-old chickens. The number of chickens whose sex has been determined by these persons is set out in Table 4.

TABLE 4.

NUMBER OF CHICKS SEXED.

1948.	1949.	1950.	1951.
2,366,779	2,178,503	2,381,100	2,411,621

From this table it will be noted that a greater number of chickens was sexed during the year under review than during any of the previous three years. This being so, egg production might well have remained steady had it not been for other factors previously mentioned.

DEMAND FOR DAY-OLD CHICKENS.

Many farmers have intimated to officers of the Branch that they did not intend to order chickens until a new contract price with Great Britain had been decided upon and would do so then only if a substantial increase were effected.

Several hatchery owners in the Brisbane, Toowoomba and Bundaberg areas were contacted with regard to the demand for chickens during the early part of the 1952 hatching season as compared with the corresponding period of 1951. From their replies it is estimated that the overall demand so far is about 40% less.

As a reasonably satisfactory contract price was announced in June, it should now be possible for a quick build-up of present depleted flocks to take place. It has to be remembered, however, that the State lost a substantial number of potential laying fowls through slaughter during the past year. It is considered most desirable that contract prices be finalised much earlier in the year in order to encourage the farmer to maintain his flock by making arrangements for the necessary replacements.

POULTRY ADVISORY BOARD.

This Board, on which the Branch is represented, met on four occasions. Business dealt with included consideration of the precept to be issued on egg-marketing boards, grants to organisations for conducting poultry research work, the accreditation of hatcheries, slaughtering of poultry, and the Branch's own programme for experimental work.

EXPERIMENTAL WORK.

Condensed Whale Solubles Feeding Experiments.

A by-product of the Australian whaling industry known as condensed whale solubles is now produced at the various whaling stations in Western Australia, and it is anticipated that, with the commencement of whaling operations in Moreton Bay, more of this product will be available. It is produced during the reduction of whale-meat into whale-meal and in appearance somewhat resembles molasses. It has a penetrating odour similar to that of commercial meat extracts.

The sample used by the branch for experimental purposes was supplied by courtesy of the Western Australian Whaling Commission. On analysis it was found to have a crude protein content of 53.2% and a moisture content of 41%.

Two experiments were conducted during the year under review to ascertain whether condensed whale soluble (C.W.S.) was a suitable source of animal protein for inclusion in poultry mashes. As no information was available on the amino-acid composition of condensed whale solubles at the commencement of the first experiment, it was decided to use this product at various levels in rations containing no other form of animal protein to determine whether it was a source of vitamin B12.

Protein derived from animal sources (such as meat-meal, liver meal, &c.) is superior to protein derived from vegetable sources (such as linseed meal and peanut meal) as a growth promoter in young birds for two reasons—firstly, because animal protein is a very rich source of vitamin B12 (which was first isolated from liver extract and described as the "Animal Protein Factor"); and secondly, because animal protein provides an almost complete range of essential amino-acids.

The solubles were added to three all-mash starter rations depending on peanut meal as the protein-rich source at the rate of 2 per cent., 4 per cent. and 6 per cent. Each ration had a crude protein level of approximately 19 per cent. The control ration differed from these rations only in that the peanut meal and condensed whale solubles were replaced by meatmeal and buttermilk powder. Synthetic riboflavin, commercial-grade manganese sulphate, and fish-oil emulsion containing vitamins A and D3 were also added to each of the rations.

Table 5 sets out the rations in full.

TABLE 5.

RATIONS USED IN WHALE SOLUBLES FEEDING TRIAL.

——	Control.	R2.	R4.	R6.
	Lb.	Lb.	Lb.	Lb.
Condensed whale solubles ..	..	2	4	6
Peanut oil meal (40% protein) ..	20	17	14	
Meatmeal (50% protein) ..	12	..	..	..
Buttermilk powder	8	..	..	..
Bone-meal (5% protein) ..	..	2	2	2
Wheatmeal ..	44	40	41	42
Bran	15	15	15	15
Pollard	20	20	20	20
Salt premix* ..	1	1	1	1

* Salt Mixture = Common salt .. .. .. 1 lb.
Synthetic riboflavin .. .. 160 mg.
Manganese sulphate .. .. 16 gm.

Four groups each of 80 chickens per group were used in each test. The stock were Australorp cockerel chickens bought as day-old from commercial sources. In both experiments all chickens were weighed weekly until eight weeks of age and thereafter at fortnightly intervals until they reached a marketable age. Food consumption was recorded on a fortnightly basis. The chickens were placed in a four-tier electrically heated battery brooder at day-old and remained there for one month, when they were transferred to laying pens.

The weights at 8 weeks and 14 weeks for Experiment 1 and 8 weeks and 12 weeks for Experiment 2 are set out in Table 6. Feed-efficiency figures, which were calculated by dividing the amount of feed consumed per chick by the gain in weight per chick, are also included in this table.

TABLE 6.

Results of Whale Solubles Feeding Trial.

—	Rations.			
	Control.	2% C.W.S.	4% C.W.S.	6% C.W.S.
Experiment 1.				
Average weight per chick at 8 weeks (oz.)	30·2	26·5	26·1	26·5
Average weight per chick at 14 weeks (oz.)	67·8	58·6	57·2	60·7
Feed efficiency (8 weeks)	3·34	3·43	3·46	3·59
Experiment 2.				
Average weight per chick at 8 weeks (oz.)	24·6	19·2	19·4	20·7
Average weight per chick at 12 weeks (oz.)	42·7	34·4	34·0	38·6
Feed efficiency (8 weeks)	3·15	3·48	3·46	3·38

While the experiments did not establish conclusively that condensed whale solubles had a high nutritive value, when fed at the rate of 6 per cent. they produced heavier weights at 14 weeks in Experiment 1 and at 8 weeks and 12 weeks in Experiment 2 than either of the rations containing 2 per cent. and 4 per cent. C.W.S. The control ration in both experiments was far superior to all other rations, as evidenced by weights and by the feed-efficiency values.

In view of recent favourable reports from overseas on the use of condensed whale solubles, further work will be undertaken to determine whether this material can be used as a direct replacement of meatmeal.

High-Level Maize Feeding.

During the year under review a continuation of the feeding of high levels of maize to hens in their second year of production was undertaken at Kairi Regional Experiment Station. In addition, a maize-feeding trial was carried out with Australorp pullets to see whether the production obtained from these birds during 1951 confirmed the results obtained with Australorp pullets in 1950.

Hens.—These birds in their pullet or first year of production had been fed laying rations containing 55 per cent., 62.5 per cent. and 70 per cent. maizemeal in addition to other normal mash ingredients. Results obtained showed that there was no significant difference in production between rations. It was decided to cull this flock down to 360 birds and to maintain them on the same rations and in the same groups until the end of the second year of production.

As a result of this work, data are now available on the effect of feeding high levels of maize from day-old to the end of the second year of production (a period of 2½ years) to birds from the one source and the one hatch.

A comparison of first and second year production and the feed efficiency as measured by production is set out in Table 7.

TABLE 7.

Results of High-level Maize-feeding Trials.

—	Ration 1. (55% Maize.)	Ration 2. (62·5% Maize.)	Ration 3. (70% Maize.)
Av. *First Year* (production per bird per year) ..	196·8	204·7	200·4
Av. *Second Year* (production per bird per year) ..	138·7	140·1	125·7
Lb. of feed to produce 1 doz. eggs .. (*first year*)	6·16	6·16	6·21
Lb. of feed to produce 1 doz. eggs .. (*second year*)	8·0	8·27	8·83

The results indicate that laying rations containing up to 70 per cent. maize will give good egg production. From the feed efficiency of production figures it would appear that a 70 per cent. maize laying ration is not as efficient as rations containing lesser amounts.

Pullets.—A total of 450 Australorp pullets was divided into 9 groups of 50 each. Three of these groups were placed on each of the maize rations as used for the first-year production test in 1950 and the second-year production test in 1951. This test began during the early part of February 1951 and concluded in February 1952. As had been found in the previous year's test, maize may be fed at levels up to 70 per cent. of the ration with no discernible effect on production.

The results for this test are set out diagramatically in Fig. 3, where the first-year production for 1950 and the second-year production for 1951 are also shown.

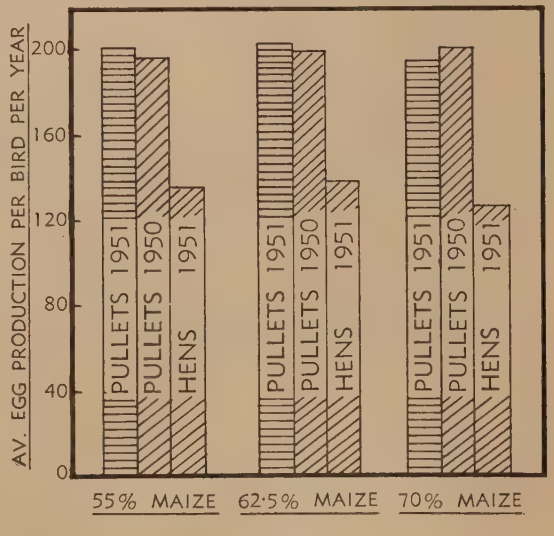


Fig. 3.

Average Production per Bird per Year on Laying Mashes Containing Increasing Quantities of Maize.

Feeding BHC Treated Grain.

During the first half of 1951 experiments were in progress at Yeerongpilly Animal Health Station to determine whether BHC when added to poultry mashes would impart off-flavours to poultry flesh and eggs. This insecticide had been used successfully against weevil infestation in seed grain, but because of its characteristic odour it was desirable to assess its effect during prolonged feeding to poultry. Both commercial and deodorised forms of BHC were used in a prepared mash at two levels—5 p.p.m. and 25 p.p.m. gamma isomer (the active principle of this insecticide).

Tests completed prior to 30th June, 1951 had established the fact that commercial benzene hexachloride produced definite taints in flesh and eggs.

Groups of cockerels were maintained on mashes containing both levels of deodorised BHC for a period of almost six months without off-flavours being detected by officers of the Division of Dairying with special training as cream and butter-graders.

Eggs from groups of pullets fed on the deodorised BHC-treated mashes were also tested at regular intervals by dairy officers. In these tests it was found that some off-flavours were noticeable after four months of feeding in eggs from pullets on mash treated with 25 p.p.m. deodorised BHC, and that by five months at least half of the eggs submitted to the tasting panel were found to be definitely tainted. Definite off-flavours were also noticed after almost six months of continuous feeding in eggs from pullets fed mashes to which 5 p.p.m. deodorised BHC was added. Dairy officers stated that, in their opinion, the degree of tainting was not nearly so strong as that found even in eggs from the 5 p.p.m. commercial BHC group. However, this off-flavour was sufficiently pronounced to be detected by home consumers who were not aware of the origin of the eggs.

These experiments indicate that the objectionable flavours in eggs and flesh resulting from the use of commercial BHC in mashes, and the definite taint in eggs associated with the deodorised form of BHC, render these preparations, even at the lower level of 5 p.p.m. unsuited for use as insecticides in grain destined for poultry-feeding.

DISEASE AND PEST CONTROL.

In addition to the numerous calls and enquiries made by poultry-raisers at headquarters with reference to diseases in poultry, the field staff of the Branch investigated over 400 outbreaks of disease. The percentage of outbreaks was as follows:—

	Per cent.
Leucosis	23
Coccidosis	20
Vitamin A deficiency	20
Other vitamin deficiencies	3
Coryza	11
Fowl Pox	8
All others	15

Leucosis.—The only method of control that offers any prospect of a material reduction in the incidence of this disease is the development of resistant strains. This is a long-term project and beyond the means of commercial poultry-raisers. Until such time as resistant strains become available, farmers can only be advised to use aged birds in preference to pullets for breeding purposes.

Coccidiosis.—This disease is more general than the percentage indicates. As the symptoms and the effect upon chickens are very characteristic, farmers with previous experience of outbreaks are in many instances able to detect the trouble in its early stages and take the action necessary for control.

Vitamin-A Deficiency.—The shortage of green-feed was undoubtedly responsible for the high incidence of this disease. Fish oils and fish-oil emulsions have been freely available, but the high cost of cereals and other feedstuffs has induced many to endeavour to reduce costs by refraining from using vitaminised preparations.

Pullorum Disease.—Fewer birds were blood-tested by officers of the Branch than during the previous season. Table 8 gives the districts and the number of birds tested in each area for 1950-51 and 1951-52. It is seen that the decline in testing was much greater in country centres than in Brisbane.

TABLE 8.

PULLORUM TESTING.

District.	1950-51. Number Tested.	1951-52. Number Tested.	Percentage Decrease.
Toowoomba	41,590	31,207	24
Ipswich	8,873	4,784	46
Brisbane	184,801	163,322	11
Bundaberg	18,373	14,055	23
Rockhampton	8,246	3,028	63
Townsville	6,360	6,293	1
Atherton	13,716	10,638	22

Stickfast Flea Control.—In the Boonah and Normanby area, control is proceeding very satisfactorily with the use of DDT. Flea infestation has been reduced to such a level that subject to rigid conditions poultry will be allowed to leave the area for exhibition purposes from clean premises.

An outbreak occurred in the Helidon area. After an intensive survey it was found that the outbreak was confined to one farm. Although the premises and poultry are now apparently free from the flea, the property will be kept under observation until next summer.

EXTENSION WORK.

Approximately 3,000 visits to farms were made by officers for the purpose of offering advice and 32 public lectures were given during the year; in addition a considerable advisory service takes place at Head Office. A record kept for the last half of the financial year shows that over 200 publications were distributed to farmers in reply to correspondence and one officer alone stationed at Head Office has interviewed and given literature on various phases to no fewer than 211 poultry-raisers during the same period.

In addition, owing to the shortage of feedstuffs used in mashes by commercial poultry-raisers, many calls have been made on the Assistant Husbandry Officer with regard to the formulation of rations from foodstuffs available from time to time.

DIVISION OF DAIRYING.

FIELD SERVICES BRANCH.

Mr. R. A. Paul, Director of Field Services.

An appreciation of the severity of the drought experienced in the dairying areas of the State may be gained from Fig. 1.

Below-average rainfall was experienced in each of the 12 months shown until March 1952. Further good falls were received in April, May and June 1952, with the result that production was in excess of average for the last two months.

Table 1 shows the serious decline in production during the year due to drought conditions. Figures for dairy cattle numbers show a decline due to stock losses from the effects of drought and to a minor degree to a change-over to other farming activities in some areas.

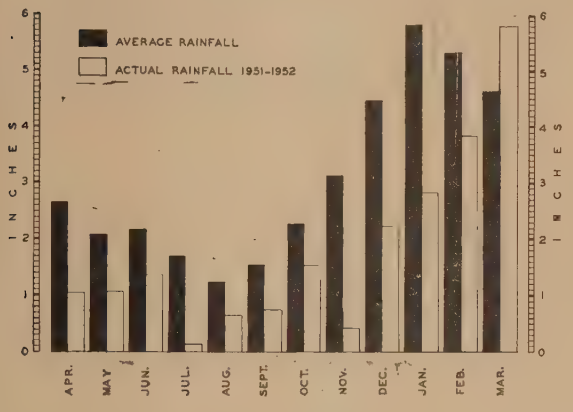


Fig. 1.

DIAGRAM ILLUSTRATING THE SEVERITY OF THE 1951-52 DROUGHT.—The columns give a composite picture of the monthly rainfall at 10 important dairying centres.

TABLE 1.

SUMMARY OF PRODUCTION STATISTICS.

Year.	Dairy Cattle* (000).	Dairy Cows in Milk and Dry* (000).	Butter Production† (tons).	Cheese Production† (tons).	Total Milk Gallonage† (000,000).
1945–46..	1,443	988	45,198	12,023	269
1946–47..	1,332	891	33,078	7,720	207
1947–48..	1,382	923	46,454	9,641	273
1948–49..	1,423	930	47,187	9,410	277
1949–50..	1,433	927	48,197	9,170	281
1950–51..	1,440	928	47,402	8,674	263
1951–52..	1,296	823	27,850	4,700	150

* As at March 31. † For year ending June 30.

BUTTER PRODUCTION.

Amount.

The production of butter for the year was 62,385,094 lb., a very serious decline compared with the year 1950-51.

Under the Commonwealth Government's guaranteed prices plan, the return per lb. of choice commercial butter to the dairy farmer was increased from 2s. 8½d. to 3s. 6d. from July 1, 1951, the average payment by Queensland butter factories being estimated at 3s. 5½d.

The trend of butter production over the past seven years is shown in Fig. 2. The graph shows that production for the year under review was well below that for the drought year of 1946-47.

The low monthly rainfall from April 1951 until February 1952 precluded in the main the sowing of winter and early-summer fodder crops, while pasture growth was very poor. Insufficient water supplies also had a very adverse effect on production.

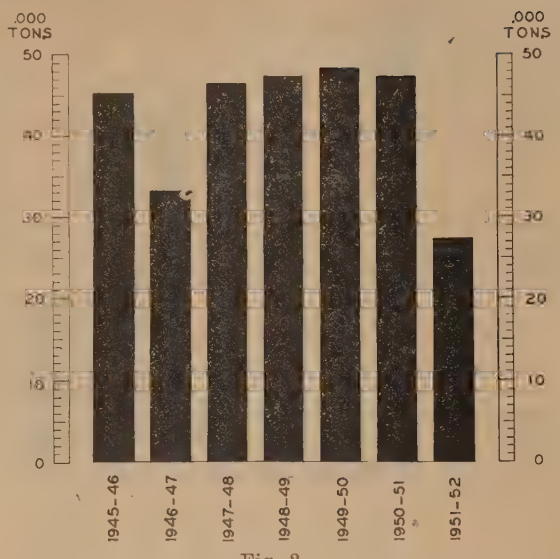


Fig. 2.

QUEENSLAND BUTTER PRODUCTION, 1945-46 TO 1951-52.

Quality.

The official gradings of butter for the year (see Table 2) show that quality was somewhat lower than in the previous year and in both 1950-51 and 1951-52 was considerably below that for 1949-50. In 1950-51 the serious weed growth early in the year and the drought, which commenced in February, 1951, were responsible for the decline, while in 1951-52 the prolonged drought caused cream supplies to decline so seriously that deliveries to factories were much more infrequent and irregular than normal. It is usual during the summer months of high production for factories to receive cream four times weekly, but during the period under review most factories instituted a twice-weekly service, with in some cases delivery three times per week. The above fact, coupled with insufficient food supply and inadequate water supplies, resulted in cream of poorer quality reaching the manufacturing plants from the producer.

TABLE 2.

OFFICIAL GRADINGS OF BUTTER.

Grade.	1949–50.	1950–51.	1951–52.
	%	%	%
Choice	49·65	39·49	32·45
First	45·00	54·79	60·03
Second and Pastry	5·35	5·72	7·52

Factory Buildings and Equipment.

Necessary alterations and additions to factory buildings have been carried out at various factories as material and labour have become available. An increase in efficiency of manufacture has resulted.

Two factories, Beaudesert and Proston, installed triple-vacreation units during the year. Other factories have been successful in obtaining churn replacements, either as new churns complete or as barrels, but in general such equipment is in very short supply and many factories are unable to obtain replacements, although orders have been placed for many months.

CHEESE PRODUCTION.

Amount.

The remarks applying to the decrease in butter production also apply to cheese production. In addition, for periods varying from two weeks to several months during the early portion of 1952, 10 additional cheese factories diverted milk supplies from cheese manufacture to wholemilk supply to the Brisbane area.

Production decreased from 19,430,199 lb. in 1950-51 to 10,528,124 lb. in 1951-52. Uuder the guaranteed prices plan the average payout to suppliers during the year was 4s. 7½d. per lb. butterfat, compared with 3s. 6½d. in 1950-51.

Fig. 3 shows production for the past seven years.

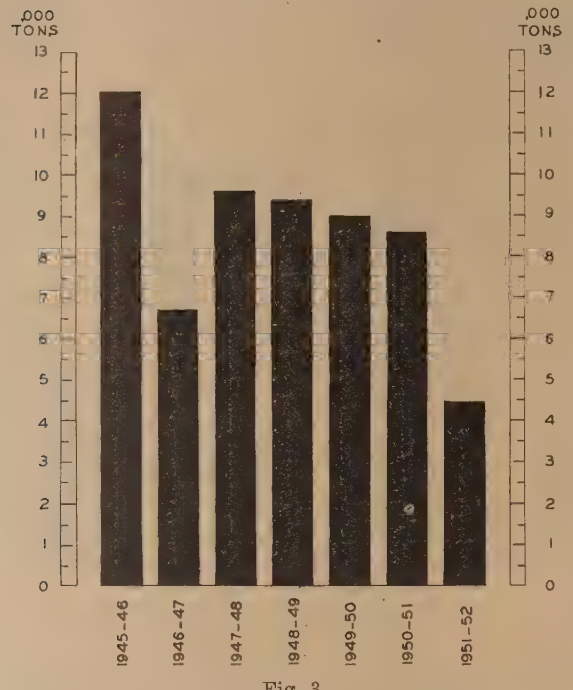


Fig. 3.

QUEENSLAND CHEESE PRODUCTION, 1945-46 TO 1951-52.

Quality.

The official gradings of cheese for the past three years are set out in Table 3.

TABLE 3.

OFFICIAL GRADINGS OF CHEESE.

Grade.	1949–50.	1950–51.	1951–52.
	%	%	%
Choice and First	79·8	70·34	68·26
Second	19·54	28·43	30·64
Third	·66	1·23	1·10

In view of the seasonal conditions, the quality of cheese for the year under review can be regarded as reasonably satisfactory. Although results for the past two years have been below those for 1949-50, cheese quality in that year was the best recorded in this State. The percentage of choice and first quality in 1951-52 was slightly below the average for the past 10 years, but this is not significant, bearing in mind that milks of abnormal quality due to drought conditions made the cheesemaker's task of producing a good-textured cheese much more difficult than is normally the case. Faults in manufacture were apparent for the greater portion of the year, and as a result quality suffered.

Factories and Equipment.

As previously indicated, a number of factories diverted supplies to wholemilk consumption for a portion of the year. Four other factories closed. Kraft Walker Cheese Co. Pty. Ltd. has almost completed the building of a factory at Kenilworth. All cheese factories have received regular visits from field officers, who have paid particular attention to the quality of milk from suppliers. Materials for effecting necessary improvements to factory buildings are in short supply and this applies particularly to cement. However, some improvements have been effected. Factories are most co-operative and anxious to carry out the work prescribed by Departmental officers.

MARKET-MILK PRODUCTION.

Amount.

Milk production declined rapidly during January and some milkless days in the Brisbane area were introduced between December and February. Areas which previously did not supply milk to Brisbane were canvassed to relieve the unprecedentedly low supplies.

Ten cheese factories on the eastern Darling Downs made supplies available. Some producers changed over from cream to milk in the Oakey, Ipswich, Lowood and Beaudesert areas. The Kingston butter factory also commenced to supply milk. These extra supplies relieved the position very considerably until good rains received in March assured adequate supplies.

Quality.

As with butter and cheese, the quality of milk was lower than in the previous season. In the main this was due to the very low supplies and the acceptance by distributors of some evening milk in order to maintain supplies to consumers.

Factories and Equipment.

During the year a new milk-pasteurising and bottling plant was opened at Mackay, and extensive improvements were carried out in the milk section of the Rockhampton plant.

Bulk-milk supplies are now generally conveyed from country areas in tankers, which have replaced can delivery. This is a decided improvement in the method of transporting milk.

A number of factories and depots improved buildings and facilities during the year, while others are at present undertaking extensive building programmes. The Dayboro factory ceased to pasteurise and bottle milk, and now is a raw-milk-chilling factory.

MILK DRYING AND CONCENTRATING.

Installations during the year included a new section for milk-drying and concentration at the South Coast Dairy (Southport), milk-drying equipment at the Beaudesert factory, and roller-drying equipment at Woodford and Kingston. Spray-drying is to be carried out in the new building being erected by Pauls Ice Cream and Milk Ltd., Brisbane. Nestles Food Specialities (Aust.) Ltd. is erecting a large condensing and milk-powder plant at Gympie.

The interest being shown by manufacturers in wholemilk products is very gratifying, as it not only means a better utilisation of total milk solids, but should result in a better monetary return to producers served by such factories.

HERD PRODUCTION RECORDING.

Despite the extremely adverse conditions experienced throughout the year, interest in both Pure Bred and Grade Herd Production Recording has been well maintained.

Pure Bred Production Recording.

During the year 112 herds were recorded, as against 135 herds in 1950-51. Of the 112 herds, 46 withdrew from testing before the end of the testing year due to adverse conditions, and this had the effect of lowering the number of cows completing lactation, as seen in Table 4.

TABLE 4.

NUMBER OF COWS COMPLETING LACTATION OF 273 DAYS AND OVER, TOGETHER WITH THEIR AVERAGE PRODUCTION.

Year.	No. of Cows.	Average Production per Cow.		
		Milk.	Test.	Butterfat.
		Lb.	%	Lb.
1946–47 ..	446	6,580	4·95	326
1947–48 ..	621	6,981	4·67	326
1948–49 ..	1,064	6,783	4·76	323
1949–50 ..	1,064	6,608	4·68	310
1950–51 ..	1,153	5,917	4·5	271
1951–52 ..	885	5,571	4·65	259

The number of cows of each breed which were submitted to test, the numbers and percentages which passed or failed to reach the standard age-production, and the number of cows withdrawn are shown in Table 5.

TABLE 5.

PARTICULARS OF COWS COMPLETING LACTATIONS.

Breed.	—	Total.	Passed.	Failed.	Withdrawn.
A.I.S. ..	No.	407	118	181	108
	%	..	29·0	44·5	26·5
Ayrshire	No.	79	29	30	20
	%	..	36·7	38·0	25·3
Friesian..	No.	18	7	9	2
	%	..	38·9	50·0	11·1
Guernsey	No.	78	24	46	8
	%	..	30·8	58·9	10·3
Jersey ..	No.	595	199	242	154
	%	..	33·4	40·7	25·9
Total..	No.	1,177	377	508	292
	%	..	32·0	43·2	24·8

It will be seen from the table that a total of 377 cows (32.0%) reached the required age-production standard, compared with 615 (46.6%) in 1950-51. The small percentage passing is disappointing. While some of the blame can be attributed to the poor season, some also can be attributed to the failure of breeders to produce animals of sufficient inherent breeding capacity to satisfy the standards. The seriousness of this situation can be appreciated when it is realised that the commercial dairymen are looking to the stud-breeders to supply the demand for bulls capable of increasing production in grade herds. Such a position is not being fully met at the present time.

The few animals qualified for entry in the registers is due to some degree to the practice in Queensland of assessing a cow on its production in only one lactation.

To qualify for entry into the Intermediate section it is necessary for a cow to produce from 1,050 to 1,100 lb. of butterfat in three successive lactations, depending on age at first calving; for entry into the Lifetime section at least 2,240 lb. of butterfat in not more than eight lactations; and for the Elite section at least 3,600 lb. butterfat in not more than 10 lactations. To gain entry to the Sires Register, a sire must have sufficient daughters entered in the various Registers.

It is anticipated that the publication of such information will induce breeders to record their cows regularly and so supply to the industry generally information regarding the high-producing families in the various herds. It is hoped in this way to improve averege production through breeding.

Grade Herd Recording.

Farmer's Own Sample Scheme.—No herds were recorded under this scheme during the year, possibly due to the expansion of grade herd recording and to the drought conditions experienced.

TABLE 6.

BREED PRODUCTION AVERAGES FOR REGISTERED HERD BOOK STOCK WHICH COMPLETED LACTATION RECORDS OF 273 DAYS OR LESS DURING THE YEAR ENDING 30TH JUNE, 1952.

Breed.		J.2.	S.2.	J.3.	S.3.	J.4.	S.4.	Mature.	All Ages.
A.I.S.	No. of Cows ..	113	56	28	17	15	12	58	299
	Milk (lb.)	5,551	5,755	6,473	6,409	6,776	5,423	7,891	6,229
	Butterfat (lb.) ..	224	233	262	254	285	204	317	251
	Test (%)	4·0	4·0	4·0	4·0	4·3	3·8	4·0	4·0
Ayrshire	No. of Cows ..	22	13	4	3	2	4	11	59
	Milk (lb.)	5,814	6,794	6,587	7,271	7,140	7,817	5,912	6,356
	Butterfat (lb.) ..	243	290	259	288	323	326	247	266
	Test (%)	4·2	4·3	3·9	4·0	4·5	4·2	4·2	4·2
Friesian	No. of Cows ..	5	2	3	2	..	..	4	16
	Milk (lb.)	6,219	8,086	7,272	7,271	..	..	6,789	6,294
	Butterfat (lb.) ..	214	290	280	283	..	..	301	267
	Test (%)	3·4	3·6	3·9	3·9	..	..	4·4	3·9
Guernsey	No. of Cows ..	21	5	5	4	9	4	22	70
	Milk (lb.)	4,739	4,804	6,207	6,646	6,944	6,538	5,669	5,637
	Butterfat (lb.) ..	231	224	298	319	301	286	214	262
	Test (%)	4·9	4·7	4·8	4·8	4·3	4·4	4·5	4·7
Jersey	No. of Cows ..	172	53	46	36	17	23	94	441
	Milk (lb.)	4,351	4,816	5,012	5,089	4,906	5,927	5,961	4,983
	Butterfat (lb.) ..	227	251	265	267	271	303	319	262
	Test (%)	5·3	5·2	5·3	5·3	5·5	5·1	5·4	5·3

All Ages and All Breeds :—No. of Cows, 885 ; Milk, 5,571 lb. ; Butterfat, 259 lb. ; Test, 4·6 %.

Table 6 shows the average production, according to breed and age groups, of cows which completed lactations of 273 days or less.

During the year the second annual Report on Pure Bred Production Recording was published as a supplement to the *Queensland Agricultural Journal*. The report shows the production of all cows completing lactations during the year, as well as the average production of daughters of sires used in the stud herds under test. The report has been well received by dairy-farmers, many of whom are using it as a reference to indicate those "cow-families" which have suitable production lines.

Registers of Merit.

As a further guide to the dairy-farming community in selecting superior "families," Registers of Merit for both bulls and cows have been compiled, and the first lists have been submitted for publication.

Table 7 shows the number and breed of cows and sires eligible for the Registers.

TABLE 7.

SUMMARY OF COWS IN REGISTER OF MERIT.

Section.	A.I.S.	Ayrshire.	Friesian.	Guernsey	Jersey.	Total.
Intermediate	18	1	..	1	40	60
Lifetime ..	5	..	1	1	5	12
Elite ..	1	..	..	..	..	1

Sires Register of Merit .. .. .. A.I.S. 1

Group Herd Recording Scheme.—During the year 45 groups were in operation, as against 42 in 1950-51. It was very disappointing that drought affected most of the State and prevented expansion to the anticipated number of 50 groups.

As the effects of the drought became more and more severe, a number of farmers were forced to withdraw their membership, but as conditions improved numbers were once again increased. It is apparent that farmers appreciate this service and expansion is expected.

All records are held in Brisbane, where automatic machines have been installed to cope with the volume of information coming forward. This system will

greatly facilitate the compilation of information necessary to make the fullest use of herd improvement results.

During the year ended 30th September, 1951 (the close of the herd-recording year), 40 groups had been operating sufficiently long to have cows completing lactation. A total of 26,798 cows from 814 herds completed lactation, with an average of 146 lb. butterfat, compared with 152 lb. butterfat in 1949-50.

Table 8 gives the number of cows and their average production according to age groups.

TABLE 8.

AVERAGE PRODUCTION OF COWS IN AGE GROUPS.

Age Group.	Number of Cows.	Average Milk Yield.	Average Butterfat Test.	Average Butterfat.
		Lb.	%	Lb.
2 years ..	2,956	2,748	4·5	123
3 years ..	2,113	3,069	4·5	137
4 years ..	1,651	3,471	4·4	154
Mature ..	7,330	3,588	4·4	156
Unknown ..	12,748	3,303	4·4	145
Total ..	26,798	3,312	4·4	146

The average production of cows in the various major districts is shown in Table 9.

TABLE 9.

DISTRICT AVERAGE PRODUCTION.

District.	No. of Herds.	No. of Cows.	Average Milk Yield.	Average Test.	Average Butterfat.
			Lb.	%	Lb.
Eastern Downs ..	169	4,566	3,939	4·2	167
Western Downs ..	57	2,241	3,320	4·1	135
South-east Queensland	316	11,330	3,150	4·6	146
South Burnett ..	97	3,626	3,115	4·2	131
Central Burnett ..	35	757	2,078	4·2	87
Upper Burnett ..	20	1,074	3,702	4·3	159
Port Curtis	31	1,042	1,979	4·4	87
Mackay	18	222	2,335	4·5	106
Atherton Tableland	71	1,940	4,234	4·4	186

The Central Burnett and Port Curtis districts are included for the first time; the low average production per cow reflects the severity of the drought in these particular areas.

As a comparison with Table 8, Table 10 has been compiled to show the effect of length of lactation on production. Only cows which have completed the full lactation period of 270 days have been included in this table.

TABLE 10.

EFFECT OF LENGTH OF LACTATION ON PRODUCTION.

Age Group.	Number of Cows.	Average Milk Yield.	Average Test.	Average Butterfat.
		Lb.	%	Lb.
2 years ..	678	3,957	4·5	178
3 years ..	555	4,202	4·6	191
4 years ..	443	4,475	4·5	203
Mature ..	1,869	4,728	4·5	210
Unknown ..	3,104	4,493	4·4	200
Total ..	6,649	4,479	4·5	200

As the table shows, the average production of cows completing 270 days' lactation was 200 lb., compared with 146 lb. for those cows completing lactation of 270 days or less. This represents an increase of 54 lb. of butterfat per cow, equivalent at ruling prices to the sum of £11 11s. Only 6,649 cows (24.8 per cent.) completed 270 days, indicating the necessity of concentrating on breeding animals which will remain in production for the full nine months, and the need to provide sufficient fodder to enable them to continue for this period.

Several articles on herd improvement were published during the year, and work continues on the collection of data necessary for carrying out surveys in connection with causes of herd wastage, month of calving, sire surveying and other information expected to improve dairy-farm management and practice.

DAIRY INDUSTRY EFFICIENCY GRANT.

In addition to the work undertaken on herd improvement from Grant funds, which has been dealt with in the previous section, activities under the Commonwealth Dairy Industry Efficiency Grant supervised by the Branch include:—

(1) Development of demonstration farms and the conduct of field days on them.
(2) Dairy-farm competitions and the conduct of field days on prize-winning farms.
(3) Operation of a Mobile Film Unit.
(4) Cheese-milk cooling demonstrations.
(5) Subsidised interstate transport of herd sires.
(6) Handbook "Dairy Farming in Australia," Queensland Edition.

Demonstration Farms.—In operating demonstration farms the intention is to illustrate how dairy-farm production and efficiency can be economically increased by the provision of improved pastures and crops and conserved fodder; the subdivision of paddocks to provide rotational grazing facilities; the use of lime and fertilizer where required to stimulate growth; the use of home-grown grains for supplementary feeding; the application and use of herd recording and modern milking methods; the correct use of improved cleaners and sterilizers; water treatments; and the use of approved methods of cooling milk and cream.

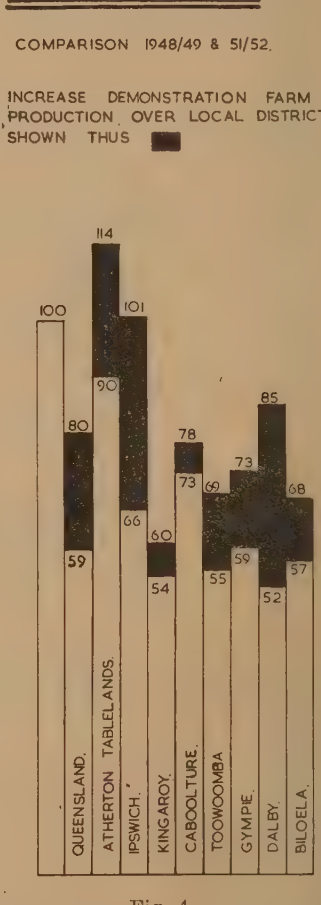


Fig. 4.

COMPARISON OF SALES OF DAIRY PRODUCE FROM DEMONSTRATION FARMS COMPARED WITH OTHER FARMS. —The first column represents the average for 1948-49.

During the year eight demonstration farms were discontinued; five of these were sold and three reduced their dairying activities to such an extent as to make further demonstration impracticable. At present 44 farms are operated in groups situated in the Toowoomba, Dalby, Ipswich, Gympie, Kingaroy, Caboolture, Biloela and Atherton districts, and there are 11 single-unit demonstration farms at Rockhampton, Mackay, Gayndah, Deuchar, Killarney, Cunningham, Pittsworth, Chinchilla, Esk, Oxenford and Mundubbera. The last four were commenced during the year under review.

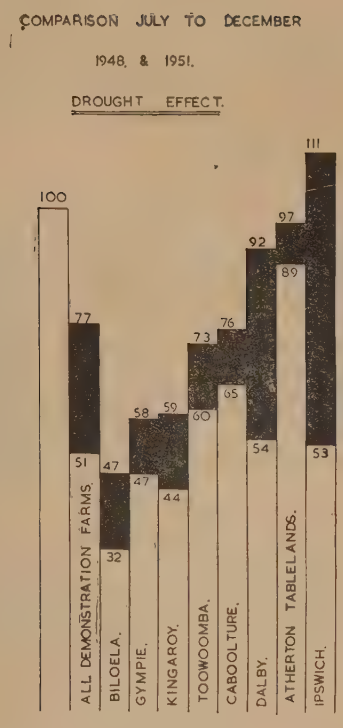


Fig. 5.

COMPARISON OF PRODUCTION OF DEMONSTRATION FARMS AND OTHER FARMS DURING THE DROUGHT MONTHS OF JULY-DECEMBER, 1951.—The first column is the average for the corresponding months in 1948.

For the purpose of showing production improvement, the year just prior to the commencement of the demonstrations (1948-49) has been taken as the base year. Figure 4 illustrates the sales of dairy produce per group of farms for the year 1951-52, as compared with the production for 1948-49, and also a similar comparison for all the dairy farms in the corresponding district. The black area shows the difference between these comparisons. The severe effect of drought on all production is well illustrated.

For all groups of demonstration farms the production was 80% of the base year, whereas for all dairy farms in the State the production was only 59% of the base year. Had the majority of Queensland dairymen adopted the method of feeding home-grown hay, silage, and grain, as was done on most demonstration farms, the butter production of this State could have been 22,000,000 lb. greater than it was.

When Figures 4 and 5 are considered together, it appears that not only did the groups of demonstration farms withstand drought better than other farms, but they also increased production much quicker during the relatively good months of April, May and June.

It is hoped that dairymen adjacent to demonstration farms will note what has happened, and how it has been done in their particular district, under the prevailing soil, water and climatic conditions.

All demonstration farm groups show a smaller effect of drought than the other farms in their respective districts. The differences vary from 5% in the Caboolture district (where farmers have acquired the habit of providing supplementary feeding for milk production) to 35% in the Ipswich district. The only groups to exceed the production of their base year were Ipswich and the Atherton Tableland.

Fig. 6 compares the quality of the dairy produce during 1951-52 on the demonstration farms with that of the respective districts.

For all of the group demonstration farms, 89% of the production was graded choice at the factory, whereas for all dairy farms in Queensland, 66% of the production was so graded. The increase in production of choice grade by the individual demonstration groups, when compared with their respective districts, varied from nil on the Atherton Tablelands, where all production was graded choice, to 25% for the Kingaroy group.

Table 11 illustrates the improvement which has taken place in quality on demonstration farms since the commencement of these demonstrations. When considered in conjunction with district quality the position is quite sound.

TABLE 11.
PERCENTAGE OF CREAM GRADED CHOICE.

District.	Demonstration Farms.		Other Farms.	
	1948–49.	1951–52.	1948–49.	1951–52.
Queensland	73	89	60	66
Atherton Tablelands	99	100	98	100
Ipswich ..	47	82	37	69
Kingaroy ..	96	87	82	62
Caboolture	95	97	91	90
Toowoomba	59	81	55	76
Gympie ..	93	89	93	85
Dalby ..	37	87	46	75
Biloela ..	46	71	42	52

Field days were conducted on seven demonstration farms during the year. Talks and discussions centred around the work being carried out on the particular farm, and progress results in relation to increased production and quality improvement were also discussed. Judging from the big attendances and the interest displayed by visiting farmers, the work being carried out on demonstration farms is being closely followed in the areas where the farms are located. Such farms are now the focal point from which extension work receives impetus.

Dairy Farm Competitions.—The second judging of the 1951 competition was completed during the year and two judgings of the 1951-52 competition were made.

Increased interest is being shown by dairy-farmers: the total of 104 entries received in 1951 grew to 191 in 1951-52 despite adverse seasonal conditions.

Field days were conducted in nine areas on prize-winning farms in the 1951 competition; other days arranged had to be cancelled due to drought. Very good attendances were reported at all field days and

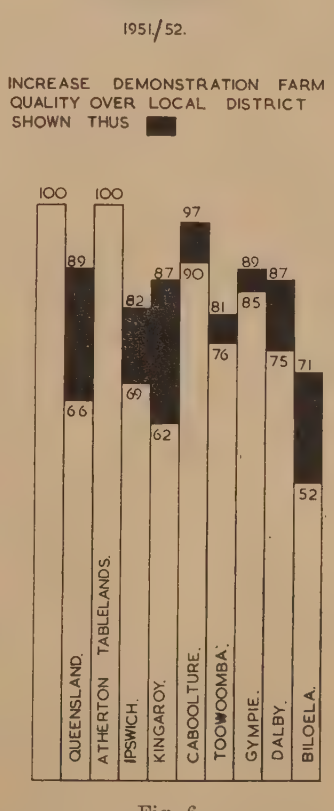


Fig. 6.

COMPARISON OF QUALITY OF DAIRY PRODUCE ON DEMONSTRATION FARMS AND OTHER FARMS IN 1951-52.

it is certain that the competitions have had the effect of increasing the efficiency of management on many dairy-farms. Competitors receive details of the points allotted to them and to the prize-winners so that a comparison can be made to ascertain those sections in which improvement is desirable. Discussions at field days usually centre around the points obtained in the various sections by the competitor on whose farm the day is held, Departmental officers indicating how improvement may be effected. It is considered that such competitions are a very important part of Departmental extension service to the dairy farmer.

Film Unit.—Unfortunately, it was not possible to keep the unit in operation continuously during the year, due to difficulty in obtaining operators prepared to accept a position which necessitates filming each night's programme at a different centre. A total of 73 screenings was carried out to an audience of 6,300. This method of extension has been very well received throughout the State and has had the desired effect of stimulating farmers to adopt more efficient methods. Some difficulty has been experienced in obtaining suitable films for screening, particularly those with an Australian bias, but all avenues of production are being followed up, and several films made in Australia are expected to arrive in the State in the near future.

A movie camera has been purchased from Grant funds for the purpose of filming items of interest on dairy farms in Queensland, and as the opportunity offers films of local interest will be built up for screening at farmers' gatherings.

Cheese-Milk Cooling Demonstrations.—The necessary equipment for carrying out these demonstrations has now been installed on the 10 selected farms in the cheese producing areas. All details concerning operation of the equipment and results of tests of the milk will be examined in order to assess the effect on the quality of the resultant cheese manufactured from treated and untreated milks. The value of the demonstration will not be apparent until the warmer months of the year.

Sire Subsidy.—During the year eight farmers availed themselves of the service, six bulls being of the Jersey breed and two A.I.S.

Handbook.—The Queensland edition of *Dairy Farming in Australia* was issued in December, 1951. The book has been distributed free of cost to all *bona fide* dairy farmers in the State, and many very favourable comments have been received from farmers regarding the excellent coverage given to the various aspects of dairy-farm management. The publication fills a long-felt want for a handy reference book on the everyday problems confronting the dairy-farmer.

STAFF.

One officer of the Branch retired during the year, 7 officers resigned their positions and 12 new officers were appointed. An additional position of Dairy Adviser was created at Mackay and filled. It was necessary to transfer the headquarters of some officers in order to fill the centres offering.

REBATES OF FREIGHT ON BULLS.

Applications were approved in respect of the refund of freight paid on the transport by rail of 108 bulls, the progeny of female stock entered in the Advanced Registers of the various Breed Societies. The expenditure amounted to £843 2s. 2d.

GENERAL.

Other activities which occupied a considerable portion of the time of Branch officers were the routine administration of the *Dairy Produce Acts*, the conduct of examinations for qualification as appointment as Dairy Officers, the conduct of examinations for certificates under the *Dairy Produce Acts*, examination of factory accounts, registration of farms and factories, statistics of manufacture, payouts and gradings of butter and cheese factories, control of the transport of milk and cream, general advisory correspondence and articles for the *Queensland Agricultural Journal*.

Table 12 indicates the volume of regulatory and extension work performed on the farms and in the factories.

Listed below are the farm and factory visits carried out by the Brisbane Milk Board officers and field officers of the Branch on registered Milk Board producers and factories.

—	Farm Visits.	Factory Visits.
Milk Board Officers	1,881	1,265
Branch Officers	1,658	692
Totals	3,539	1,957

TABLE 12.

SUMMARY OF FIELD STATISTICS, 1951–52.

District.	Farm Visits.	Orders.	Herd Book Tests.		Factory Visits.			Suppliers' Tests.	Factory Tests.
			Herds.	Cows.	Butter.	Cheese.	Milk.		
Brisbane	3,403	136	89	761	388	..	189	3,139	241
Brisbane (Milk Quality Control) ..	2,752	206	36	259	96	5	387	11,780	222
Downs (Toowoomba)	3,754	1,018	26	267	222	187	53	9,503	1,180
Downs (Warwick)	2,222	515	91	1,594	220	211	62	6,845	4,498
Rockhampton	2,261	9	42	949	147	26	92	2,624	1,737
Maryborough	2,314	74	97	1,052	238	15	76	1,072	766
Gympie	3,285	19	94	720	382	21	73	3,690	460
Northern	424	46	27	283	52	..	62	523	903
	20,415	2,023	502	5,885	1,745	465	994	39,176	10,007

STATISTICS OF DAIRY PRODUCTS.

(Source: Queensland Government Statistician).

Year.	Milk Produced (All Purposes).	Butter Made (Factory and Farm).	Cheese Made (Factory and Farm).
	Gallons.	Lb.	Lb.
Average—1935–36 to 1939–40	282,861,000	124,422,000	11,704,000
1946–47	207,465,000	75,359,000	17,292,000
1947–48	272,791,000	105,382,000	21,607,000
1948–49	277,152,000	107,029,000	21,041,000
1949–50	281,125,000	109,278,000	20,276,000
1950–51	277,814,000	107,321,000	19,439,000

DAIRY RESEARCH BRANCH.

Mr. L. E. Nichols, Director of Research.

The Dairy Research Branch has continued to give technical aid to the dairying industry. Activities have been mainly confined to investigating problems in the production and processing of butter, cheese, and market milk, and providing technical advice to dairymen and factories.

With greater interest now being displayed in the better utilisation of milk products, such as the manufacture of powdered skim-milk, wholemilk and butter-milk, regular analyses are now sought and advice requested for improvement in composition and quality.

Chemical and bacteriological results under the Butter Improvement Service and the laboratory quality-control of market milk and cheese have shown the severity of the effect of the recent drought on the quality of dairy produce.

Steps have been taken for the establishment of laboratories at Murgon and Malanda, which will ensure a regular service to producers and factories in these important dairying districts and facilitate investigation of district problems.

Two officers originally selected for training in New Zealand have returned for duty in the Branch, and are now giving the benefit of their training to the cheese and butter industries in the course of factory surveys.

Officers have maintained a close liaison with the Field Services Branch to ensure the effective application on farms and in factories of the results of investigations and laboratory quality-control services.

The staff of the Brisbane laboratory has concentrated on problems of market milk, dairy chemistry and chemical engineering, and that of the Hamilton sub-laboratory on butter, while the Toowoomba laboratory has been engaged exclusively on cheese and cheese starters.

INVESTIGATIONS.

The principal projects undertaken are outlined hereunder.

Market Milk.

Low-Fat-Content Milk.—Low-fat-content milk again proved a major problem for suppliers and market-milk distributors, and investigations were continued to ascertain possible causes. The problem was accentuated by drought during the year, and milk of low fat content not only occurred during July, August and September but was encountered well into December. The limited trials of the previous year were extended on selected properties in the Beaudesert district. It has been the normal practice on most farms producing market milk to feed finely chaffed roughage with protein meal. Trials conducted over the past two years have shown very little effect on the butterfat test of milk as a result of feeding meatmeal, finely chaffed hay or lucerne. It was therefore decided to conduct feeding trials using also long, low-protein roughage with suitably paired groups of animals. All cows were in good condition and well fed. The same interval of 15 hours between the night and morning milkings, as normally practised, was maintained, and 7 lb. long oaten hay was fed to each cow in the experimental group after the night milking in addition to normal rations. Table 1 shows the results obtained.

The results show an appreciable improvement in milk yield, butterfat content and average test. Statistical analysis confirmed the significance of the improvement due to feeding practices. The finding that long roughage has an effect on the butterfat test of milk is of importance, because it has long been thought that the type of feed would not materially alter the test. The cause of the trend indicated in the table is being examined. It is proposed to extend the trials, in conjunction with the Cattle Husbandry Branch, to include three large herds and a set of identical twins.

Detergents and Sanitisers.—Many types of cleaners and sterilizers are being used by farmers, but little is known regarding their effectiveness.

Methods to test the relative efficiencies of various detergents and sterilants in use on dairy farms were evolved. Investigations of the majority of preparations commonly used were completed, and a paper prepared as a guide to farmers and field advisory services. Included in the 11 preparations tested were wetting agents and detergent-sanitisers (such as soda ash with sodium hypochlorite and trisodium phosphate with quaternary ammonium compounds).

In most instances, the colony counts per unit volume of rinse on each utensil were of the same order, suggesting that the results are more a reflection of the technique used on the farm than of the merit of the individual cleaners used.

The importance of the following technique of cleaning dairy equipment is thus emphasised:—

(1) Cold water (atmospheric temperature) rinse immediately after use.

(2) Treatment with a detergent solution at 160-180°F.

(3) Treatment with hot water at 200°F.

(4) A hypochlorite (200 p.p.m.) pre-rinse of all equipment before the commencement of the next milking.

On farms with a hard water supply, good results were obtained with a wetting agent in combination with trisodium phosphate. This reasonably cheap mixture was further improved by the inclusion of sodium metasilicate.

Tested separately both on farms and in the laboratory, the hypochlorites were superior as chemical sterilants to the quaternary ammonium preparations at present available. To date, the hypochlorites have proved more effective in destroying the gram-negative bacteria, which are mainly responsible for bacteriological defects in dairy produce.

Bacterial Content of Utensils.—In trials with approved detergents, the degree of contamination from various pieces of equipment on the farm was pin-pointed and standards were determined.

TABLE 1.

EFFECT OF FEEDING ON BUTTERFAT TEST.

Period.	Experimental Group of 30 Cows (Daily Production).			Control Group of 30 Cows (Daily Production).		
	Milk.	Butterfat.	Test.	Milk.	Butterfat.	Test.
	Lb.	Lb.	%	Lb.	Lb.	%
Commencement of Trial	434	16·6	3·3	463	16·6	3·1
July	470	19	3·7	413	16	3·2
August	419	17	3·6	351	13·4	3·2
September	334	13·6	3·5	288	10·8	3·1
Two weeks after feeding ceased	240	9·48	3·4	245	9·1	3·1

Table 2 sets out the geometric means of all results.

TABLE 2.
BACTERIAL CONTENT OF CLEANED UTENSILS AND MILK.

		Per ml. of rinse.
Utensils	Teat cups	241
	Milking machine	1,490
	Milk vat	3,990
	Milk strainer	518
	Milk cooler	3,710
	Milk can	8,020
	Milk bucket	118
First Milk	Teat rinses	9,640
	Through machine	11,400
	In vat	12,200
	Through strainer	44,700
	Over cooler	45,600
	In can	38,800

It will be noted that the milk vat, the milk cooler and the milk can give relatively high counts. If udders are efficiently washed, there is only a small contribution of bacteria from this source to the first milk.

The results show that if proper methods are employed, it is possible to produce high-quality milk with a colony count of less than 50,000 per ml.

Antibiotics in Milk.—Investigations commenced last year were continued, particularly in relation to the effect of penicillin on the lactic streptococci. This antibiotic agent is used widely by dairymen in the treatment of mastitis. In many instances, the milk from treated animals is not withheld from the market long enough after treatment for the dissipation of the drug used. Such a procedure is likely to create problems in cheese factories and in milk-quality examinations. Assaying methods for penicillin developed last year were continued and further possible field and laboratory tests examined.

A number of penicillinase-producing coliform bacteria have been isolated; the enzyme they produce has rendered penicillin inert. The influence of this factor on milk quality tests is being examined.

Butter.

Microscopic Appearance.—It has been realised that a high standard of manufacture, together with a high standard of hygiene, is necessary if bacterial defects in butter are to be avoided.

A method has been developed whereby an indication of the thoroughness of the working process during manufacture can be gained by microscopic examination of the butter. During the process of working butter, the moisture present is subdivided into progressively smaller droplets, and a thoroughly worked butter contains very few droplets large enough to support appreciable bacterial multiplication. The method developed involves counting the number of droplets greater than 30 microns in diameter per c.c. of butter. Statistical analysis has shown the method to be sufficiently accurate for practical purposes.

The following are typical of counts obtained during examination of butter at various stages during the working process.

Number of Revolutions of Churn.	Droplets Greater than 30 Microns per c.c.
40	220,000
52	220,000
59	172,000
66	137,000
74	25,000
96	less than 1,000

Sufficient information has now been obtained to set up the following standards relating to the amount of working.

Number of Droplets Greater than 30 Microns per c.c.	Comments.
Less than 1,000—30,000	Well worked
31,000—60,000	Fairly well worked
61,000—110,000	Rather underworked
111,000—170,000	Underworked
More than 170,000	Very underworked

The benefits to be gained from the application of the method include:—

(1) A reduction in the number of grading penalties for defects in manufacture.

(2) A greatly reduced susceptibility of butter to bacterial defects.

(3) Improved keeping quality of butter both in cold-storage and at temperatures above freezing point.

The method is now being introduced into the Butter Improvement Service for all factories, and appropriate articles prepared for use by extension officers.

Fat Losses During Manufacture.—Fat losses in buttermilk show wide variation but represent an appreciable economic loss in most butter factories. With the more intensive methods of cream processing now being adopted, there is a tendency for the butterfat loss to increase.

As a preliminary attack on the problem, data are being collected to permit the determination of the extent of such losses and the various factors which may have an influence. One factor known to affect the losses is the percentage of butterfat in the original cream and the degree of dilution during processing. Minimum fat losses occur within the range of 35-40% butterfat in the cream at churning. The following illustrates the variation in the fat percentage of cream as received and at churning. In 80 vats of raw cream received, the percentage of butterfat ranged from 37 to 47, with an average just over 40. However, the cream at churning in 148 cases examined showed—

6% with less than 30% butterfat,

49% ranging from 30% to 35% butterfat,

45% ranging from 35% to 42% butterfat.

An appreciable reduction in butterfat losses is therefore possible if a greater proportion of the churnings can be made to fall within the higher fat-content range.

Further factors influencing fat losses include type of cream, type of pasteuriser, intensity of treatment, rate of cooling and type of cooler. Table 3 illustrates the average fat losses with five different types of cream processing arranged in order of intensity.

TABLE 3.
FAT LOSSES IN CREAM PROCESSING.

Type of Processor.	Total Tests.	Range of Losses.	Average Percentage Loss.
		%	
Flash-regenerative	11	0·9–1·2	1·01
Volataliser	30	0·7–2·8	1·35
Solo-vacreator	15	0·8–1·7	1·21
Tandem-vacreator	45	1·0–2·1	1·37
Triple-vacreator	47	1·0–2·5	1·66

The results indicate that as cream processing is intensified, there is a tendency for fat losses to rise, but there is still considerable variation within each type, due to the other factors mentioned.

Efforts to reduce the occurrence of high fat losses in some factories have already met with success, even in cases where cream processing is very intensive.

Intensity of Cream Treatment.—In co-operation with officers of the Field Services Branch, trials have been initiated to ascertain the influence of the intensity of cream treatment on butter quality at a factory where choice quality was consistently degraded in spite of a rigid standard of cream grading. Experimental batches of cream were given a single normal treatment and the process was then duplicated. Appropriate controls were treated in the normal way, and the butter quality compared. The experimental consignments were generally higher in grade than the controls, and the factory concerned has now successfully adopted the practice as a normal procedure.

Table 4 shows the relative grading and fat loss results obtained on nine consignments.

TABLE 4.
COMPARISON OF SINGLE AND DOUBLE CREAM TREATMENT.

Date.	Grading Results.		Percentage Loss of Fat in Cream.	
	Single.	Double.	Single.	Double.
	(Points).	(Points).		
7–11–51	92	93	1·2	1·3
9–11–51	93	93½	..	..
17–12–51	91	92	0·9	1·3
30– 1–52	93	93	0·7	1·2
25– 2–52	92	93	0·9	1·3
27– 2–52	92	93	0·7	1·2
2– 3–52	92	93	1·1	1·4
31– 3–52	92	93	1·2	1·5
4– 6–52	93	93	1·1	1·2
Mean	92·2	92·9	0·96	1·31

The results to date show the importance of intensive cream treatment in maintaining a high standard of butter quality. However, aspects of the economics of the process are being examined, particularly in regard to fat losses.

Keeping Quality of Butter.—The keeping quality of butter is of great importance, particularly as much of Queensland's production is in transit for a long period to the United Kingdom or in storage to meet interstate winter demands. Seasonal declines in butter production have also meant longer cold-storage periods for both local and interstate requirements. A study of the factors most likely to affect the keeping quality of butter has been conducted for four years. During the past year, another 29 churnings held in cold-storage for three months were examined, and the work extended by starting a full-scale trial of the effect of pH. The results in recent years have shown a tendency towards improved keeping quality with an alkaline butter serum, and the trials commenced are designed to investigate this tendency. An interesting feature of the results to date is the good correspondence obtained between the amount of copper and iron in the butter and the degree of oxidation during storage. Table 5 illustrates the combined effect of copper and iron in relation to the peroxide values after three months in cold-storage.

Problems of Processed Cheese.—Two defects of processed cheese causing considerable economic loss were investigated. The defects were putrefactive-blown cheese and white spot in cheese. The first condition was shown to be caused by spore-forming bacteria (*Bacillus mycoides*) contaminating consignments of cheddar cheese. The causal organism was extremely proteolytic in activity, and rapidly developed putrefaction and gas. The bacteria had survived normal pasteurisation procedures as spores and were shown to be encouraged in their development by a medium of low acidity and high moisture content. It was demonstrated that the bacillus would not develop in a normal acid cheese of standard composition. Control was effected by reducing the pH and the moisture content of processed cheese, and as a further precautionary measure processing equipment was sterilized, using a solution containing 1,000 p.p.m. available chlorine.

White spot in processed cheese had not occurred for a number of years prior to its reappearance during the past year. The defect is caused by spore-forming anaerobes (*Clostridium* spp.). The causal organisms were traced in raw cheese used for processing, and have been found in milk supplies. Higher temperatures of holding cheese appeared to favour their development. A field test for the detection of anaerobic bacteria in cheese-milk supplies is also being examined.

TABLE 5.

Copper and Iron Content of Butter and Oxidation.

Range of Copper (p.p.m. x 6) plus Iron (p.p.m.).

—	Less than 1·0.	1·0–1·9.	2·0–2·9.	3·0–3·9.	4·0–4·9.	5·0–5·9.	More than 5·9.
Number of Samples.. ..	2	24	24	12	3	3	1
Range of Peroxide Values ..	0·03–·04	·00–·71	·02–·60	·23–·74	·14–1·02	·26–·90	·89
Average Peroxide Value ..	0·035	0·141	0·220	0·383	0·497	0·553	0·89

The results show the importance of avoiding contamination with copper and iron if good keeping quality is desired.

Effect of DDT and BHC on Butter.—Following suggestions that some degrading of butter may have been caused by the increased use of newer tickicides, trials were conducted on the effect of concentrations of from 10 to 50 p.p.m. of fairly pure and commercial preparations of DDT and BHC on the flavour and keeping quality of butter. The results showed no significant effect on the initial flavour or keeping quality of butter made from cream to which the preparations had been added as above.

Cheese.

Phage-Resistant Starter Cultures.—Phage infection of starter cultures still presents a most important hazard to cheese quality.

The orthodox methods of combating phage attack of cheese-starter cultures have had as their aim the prevention of phage infection. Recently, however, attention has been paid to another, and quite different, approach to the problem. It now seems to be possible to produce phage-resistant cultures and to use them for successful cheese manufacture under commercial conditions. The phage-resistant cultures produced have so far shown no sign of becoming phaged again, even after satisfactorily long periods of use (3—6 months). This method of starter maintenance permits the same culture to be used day after day without rotation, thus providing very even working acidities.

A culture can be made resistant to the phage from the factory in which it is to be used by holding an unclotted culture in the factory until it clots, and then subculturing it. In the laboratory a cell-free filtrate of phage-laden whey from the factory is used to inoculate the culture and develop the resistant strain. Work conducted so far suggests that the temperature at which phaging is permitted in the process of developing the resistant strain is important in determining the speed with which the resistant strain is developed, the vitality of the resultant strain and its morphology. So far, six Queensland cheese factories have used such cultures, all successfully. Others are using them as the resistant strains are developed against their phages. Because of the importance to the industry, these investigations are being given a high priority.

Cheese-Milk Cooling Trials.—Drought conditions prevented the extension of this work because of the limited milk supplies available. The production of high-quality milk with the aid of farm refrigeration has already been demonstrated, and methods for the manufacture of good-quality cheddar cheese from refrigerated milk have been developed. However, the effect of other methods of cooling milk and their relation to cheese quality are being investigated. The object of the work is to determine the most economical and practical method of milk-cooling to facilitate the production of high-quality cheese.

SURVEY OF WATER SUPPLIES.

It is becoming increasingly evident that the quality of dairy produce both on farms and in factories is influenced by the quality of the water supply available. With advances in milk and cream processing in factories, the necessity for a properly treated or conditioned water supply is being recognised. Butter defects have, in several cases, been shown to be associated with a faulty water supply, while boiler troubles, fuel losses, and damage and corrosion of factory equipment have been found to be attributable to hard and corrosive waters. A survey of water supplies and their suitability has therefore been commenced. During the year, 321 samples of water were analysed and treatments of various kinds determined experimentally. Already a number of treatments have been designed and installed, and results are being observed in relation to quality, economy, and efficiency. It is apparent that marked seasonal changes in composition of water supplies occur, emphasising the necessity for regular analysis and varying treatment.

LABORATORY CONTROL SERVICE.

In conjunction with the Field Services Branch, the Branch has continued to provide a laboratory control service to assist in the improvement of quality and efficiency in the industry.

Butter Improvement.

The routine chemical and bacteriological examinations of butter samples were continued, and were extended to provide a wider field of advisory services, factory surveys and investigations.

During the year, 1,516 churnings of butter were subjected to bacteriological analysis. The average bacteriological quality index for all factories under the service was 237, the possible being 400. This figure represents a drop when compared with the previous year's results, but the two figures are hardly comparable, as seasonal conditions reduced production and the average quoted is representative of a smaller number of factories.

A check on the chemical composition of butter produced was maintained, 1,513 samples being examined. For all factories, the estimated average composition was—moisture 15.65%; salt 1.43%; curd 0.85%; fat 82.07%. Such figures represent a very high standard of compositional control.

As a guide to the accuracy of cream neutralisation, 950 estimations of the pH of butter serum were made. The results show a decided preference for an alkaline butter. Over 50% of the samples examined had a pH of 7.7 or over, and only 3% had a pH below 6.8. This trend is desirable for butter of best keeping quality.

The past year saw a notable strengthening of the field activities of laboratory officers. Thirty-seven visits were paid to butter factories, during which advice was given on necessary improvements in equipment, methods and hygiene. Some visits were concerned with overcoming specific problems, such as high butterfat losses, chemical taints and bacteriological defects. Certain butter-quality problems have arisen; these were traced to the water supplies used, not only for butter-washing, but also for raising the steam used in pasteurisation. The defects were controlled by settling and adjusting the pH of the boiler-feed water, and using a quaternary ammonium compound in place of chlorine for water purification.

A further observation in the course of factory surveys was the difficulty in culturing the organisms responsible for a putrefactive defect in butter. Trials are proceeding on the use of special media and methods to isolate these organisms.

Cheese-Quality Improvement.

Cheese factories were visited on 23 occasions for the purpose of investigating factors affecting the quality of cheese.

The importance of proper acidity control in cheese-making has long been recognised, and observations of pH changes in the curd and whey and the relationship between the final pH of the cheese and cheese quality are being made.

Regular analyses for moisture and fat in cheese have shown a tendency on the part of factories to produce cheese of a higher moisture content than usual; 216 samples were examined in this work. As best keeping quality has been associated with a moisture content of approximately 36%, appropriate advices have been forwarded to factories with a view to more effective control.

Data respecting the influence of seasonal and feeding conditions on the cheese-yielding capacity of milk supplies in various districts, as well as on other factors affecting cheese yields in manufacture, are being collected.

Starter Cultures and Bacteriophage.—The branch has continued to supply high quality single-strain starters to the cheese industry, and 710 were distributed during the year. With further improvements in starter-propagation methods, most cheese factories now use the Department's single-strain cultures. To assist factories in overcoming failures due to bacteriophage, work has been continued with a view to supplying cultures which are phagically unrelated. New strains have been introduced from overseas, and their phage relationships tested before distribution. In association with C.S.I.R.O., the C-series strains were tried. The rotation chosen combines both *S. lactis* and *S. cremoris* strains. In field trials, the starters have shown good vitality, with uniform working in manufacture both in the whey and during cheddaring. The series have compared favourably with standard Departmental cultures, although they are now equally as susceptible to the effects of bacteriophage. The inclusion of *S. lactis* strains has been adopted with caution, because their phages may tend to be polyvalent. This characteristic is now under observation.

Phage Infection and Vat Stoppages.—Further investigations of the behaviour of phage have indicated that practically all slow vats due to phage attack of the starter have their origin in infection of the starter as soon as it is added to the vat. This results in stoppages in acidity production in the whey stage some 2½–3 hours later. It has not been found possible to slow up acid production by the addition of very large quantities of phage after the curd is cut. Even when the phage is added at setting, the slowing-up is very slight. Thus it is clear that from the phage point of view, vats should be set as early as possible.

This work has also shown that as equipment is the main source of phage infection, the utmost emphasis must be placed on equipment sterilization if slow vats are to be reduced to a minimum.

Phage in Air.—Efforts to trace the dissemination of phage by air in the cheese factory have been continued. Previous attempts to pick up air-borne phage in factory air by means of exposed plates were unsuccessful, except where whey separators were emitting phage-laden mist. In order to provide information on this point, a pump which will deliver a measured quantity of air in a given time has been constructed. The air to be sampled is drawn into sterile equipment at the rate of 100 ml. per minute and bubbled through sterile milk in a small flask. Any phage not absorbed by this milk is then filtered out by a cotton-wool plug completely closing the neck of the flask. This plug is afterwards pushed down into the milk, and the milk then used as a culture medium.

In no instance has phage been found in factory air even though quantities up to five litres have been drawn from over the cheese vat after cooking, at which time a sample of whey in the vat has revealed phage titres as high as 10^3.

Cheese Rennet Quality.—Routine rennet examinations have been regularly carried out. The quality of rennet generally has shown an improvement, bacteriolgical quality and strengths being now more uniform. Two new imported rennet powders were tested, and found satisfactory for use by the industry.

Market Milk Quality.

Severe drought conditions affected both the chemical and bacteriological quality of market milk.

The Brisbane and Toowoomba laboratories continued to give technical aid to both city and country milk-pasteurisation plants, in addition to providing routine laboratory quality-control services.

Table 6 summarises the results in comparison with the previous year:—

TABLE 6.

SUMMARY OF MILK EXAMINATIONS.

—	1950–51.	1951–52.
Platings—bottled pasteurised milk	1,360	1,333
Presumptive coliform tests	1,309	1,337
Phosphatase tests—		
Number	1,486	1,407
Percentage negative	99·4	99·7
Methylene blue tests at depots—		
Number	80,164	87,108
Percentage below 4 hours	6·6	8·3
Microscopic examinations	5,185	5,315
Fat tests at depots—		
Number	28,780	31,507
Percentage below 3·3%	10·8	24·0
Pasteurised milk fat tests	1,706	1,534
Average fat percentage	3·77	4·0
Bulk milks received from country depots—		
Methylene blue tests	2,933	2,896
Fat tests	2,820	2,726
Factory surveys	67	75

In addition, 2,388 milk samples, involving examinations for fat, plate count, coliform, methylene blue, and phosphatase tests, were received at the Toowoomba laboratory.

Milk Quality.—Higher percentages of low-fat tests and low methylene blue tests were recorded than in the previous year. Where raw-milk supplies have failed to reach the desired methylene blue test standards of at least 4 hours in winter and 3 hours in summer, smears have been forwarded to the laboratory for microscopic examination with a view to assisting farmers and field officers to locate the cause of low quality.

Because of prolonged drought, both the fat and solids contents of milk showed a decline, especially during the months of July, August and September, but unlike past years, the seasonal effect on the composition of milk was extended to December and January.

Pasteurisation Efficiency.—The percentage of negative phosphatase tests was higher than in the previous year, indicating that pasteurisation is efficiently carried out. Results of laboratory pasteurisation tests have revealed that many raw-milk supplies contain a high proportion of heat-resistant bacteria. The results show that in order to improve the bacteriological quality of the pasteurised product it is necessary to grade out such milks from the market-milk supply.

Technical Control.—Visits numbering 71 were made to city and country milk plants for the purpose of conducting bacteriological surveys or investigating faults in processing. Regular line-run surveys of milk plants proved effective in tracing faults in the processing and handling of milk. In addition, pasteurised bottled milk samples were collected daily from city milk plants and once weekly from a number of country depots for chemical and bacteriological examinations.

The presumptive coliform test has proved most helpful in detecting post-pasteurisation contamination. The slight contamination of pasteurised milk by coliform bacteria picked up from improperly cleaned and sterilized surfaces may escape detection if samples of bottled pasteurised milk are subjected to the presumptive coliform test after pasteurisation, or after a period in cold-storage. This difficulty has been overcome by using a period of incubation before subjecting the sample to a second presumptive coliform test. The incubation time is for a period of 5 hours at 37°C. and a 1 ml. sample of milk is used.

Further work concerning the suitability of the plate count for pasteurised milk on selected media when incubated at 37°C. and 30°C. is proceeding. The lower temperature at present being used gives a plate count approximately three times greater than at the higher temperature of incubation, and is therefore more exacting in determining the degree of bacterial contamination for advisory purposes.

Sources of Infection of Pasteurised Milk.—Investigations have shown that the most important source of contamination of pasteurised milk are the bottles, and of processed milk, the cans. It has been found possible to reduce the plate count to less than 200 per bottle in an efficiently operated bottle-washing machine. Effective can-washing at most factories presents a problem. Although the temperature and concentration of the detergent solution are of importance, the use of chemical sterilization prior to the addition of milk is essential if "commercial sterility" is to be achieved.

Keeping-Quality Test.—The British keeping-quality test for pasteurised milk is still being examined as a possible field test and guide to milk-plant operatives as to the efficiency of factory practices. The test is simply carried out by holding a bottle of milk at 68°F. for 18 hours, and then subjecting it to the modified methylene blue test. Pasteurised milk is of satisfactory keeping quality if it lasts 30 minutes or more.

Miscellaneous.—Other investigations receiving attention include—

(1) The relationship between milk quality and the distance of transport.

(2) The anaerobic-spore test as a means of detecting the quality of raw and pasteurised milk.

New Equipment.—In an effort to improve the bacteriological quality of market milk, several associations have purchased more modern pasteurisation equipment and bottle-filling and bottle-washing equipment. One association has installed a modern milk-sampling device to facilitate regular and accurate sampling of milk for methylene blue tests and fat tests.

Fermented Milk.

The use of yoghurt as a milk food is increasing, and enquiries respecting its manufacture have been answered. The bacteria in yoghurt are mainly *Streptococcus thermophilus* and *Lactobacillus bulgaricus*, which have an optimum growth temperature of about 115°F. The culture has an attractive, mild acid flavour and a fine aroma, and provides an alternative form of wholemilk.

Milk By-Products.

A number of dried milk by-products have been examined chemically and bacteriologically, and advice on improvement in quality offered.

Faults in packaging and processing have been responsible for various degrees of insolubility and off-flavours. Regular analyses for moisture have been conducted and the average moisture content reduced from 8% to 4% with benefit to quality.

Analyses of the butterfat content of buttermilk powder have shown that factories can reduce the butterfat losses in buttermilk arising in cream processing and buttermaking. Samples originally showed 12% fat, but now consistently show only 8% butterfat.

FARM SURVEYS.

Dairy Hygiene.

The majority of milk-and cream-quality problems result from bacteriological contamination in the course of production. Visits have been made each week to various farms to test the efficiency of farm practices as well as the effectiveness of the detergents and chemical sterilants in use for the cleaning and sterilizing of dairy equipment. It has been possible with bacteriological surveys to pin-point the most important sources of contamination and to derive suitable standards as indexes of efficiency.

The surveys have shown that with efficient dairying practices, it is possible to produce milk and cream of very high bacteriological quality.

Farm Water Supplies.

Many farm water supplies are very hard, which makes cleaning of equipment difficult and intensifies the formation of milkstone in equipment. It has been shown that some defects in cream quality have been due to the quality of the water supply.

Many farmers have sought advice as to the best methods of treatment. Following analyses, advice has been given. The methods adopted have suitably softened most hard waters, made cleaning more effective, reduced the quantity of detergents used, and extended the life of the equipment. Model treatments have also been developed on a number of farms for demonstration purposes under the Commonwealth Dairy Industry Efficiency Scheme.

Milking-Machine Rubberware.

At the request of the Queensland Dairymen's Organisation, the Branch began an investigation of complaints that milking-machine rubberware, particularly teat-cup inflations, deteriorated rapidly. So far, four different types of plain-rubber inflations have been tried on selected farms where average farming practices are operated. The quality of the rubberware was determined on the degree of fat absorption and the length of service given. The four sets of rubberware tested were in use for a period of seven months, at the end of which time they were considered unfit for further use. Comparisons were then made with the controls. All of the samples so far tested gave satisfactory service. There appeared to be a close relationship between the fat absorption and the composition and method of manufacture of the rubber. The amount of filler used affected the degree of fat absorption. Inflations containing a proportion of fat-resistant synthetic rubber appeared in better condition at the completion of the first set of trials. Observations also show that the life of rubberware depends on the cleaning operation, as absorbed fat quickly destroys natural rubber. Trials will be continued until all available types have been tested.

Efficiency of Machine-Milking.

An air-flow meter was obtained during the year to demonstrate the rate of air-flow necessary for efficient machine-milking. The equipment has proved useful in determining possible weaknesses in milking-machine equipment, particularly with regard to vacuum valves and vacuum-pump sizes. A vacuum regulator and a milk-flow indicator have also been under test; both have application insofar as efficient machine-milking is concerned.

With fast milking techniques and machine-stripping now widely practised, the milk-flow indicator quickly determines the completion of the milk-out. The vacuum regulator acts as a further safeguard against a faulty vacuum gauge.

Control of Flies in Dairy Buildings.

In conjunction with the Science Branch, a preliminary trial to determine the effectiveness of a new insecticide, dieldrin, on fly control in dairy buildings has been made. A dairy farm with a fairly heavy fly infestation in the milking shed was chosen. The concentrated insecticide (15%) was impregnated onto metal-gauze strips which were suspended in the shed. Tanglefoot fly papers were used for fly trappings to provide an index of fly populations.

The number of flies caught indicated that:—

(1) The strips impregnated with insecticide appeared to have resulted in a drop in fly populations immediately after each occasion on which they were placed out.

(2) The effect of the insecticide appeared to be short-lived, tending to be reduced after the first week.

The material shows promise, and it is hoped to extend the trials during next summer.

ANALYTICAL AND CHEMICAL ENGINEERING.

A total of 996 samples submitted for general analysis included milk, butter, cheese, cream, buttermilk powder, skim-milk powder, casein, stock-food, waters, detergents, boiler and scale deposits, factory wastes and brine. Many analyses carried out were for routine and advisory purposes, although a considerable number were associated with current investigational work.

A total of 15,839 pieces of dairy glassware was tested for compliance with the requirements under the *Dairy Produce Acts* for scientific glassware used in factories. Of these, 3,073 pieces (19.4%) were rejected for failing to comply with the necessary standards. The high percentage of glassware rejected emphasises the need for continuous control to ensure a high standard of precision in manufacturing glassware used for carrying out tests upon which producers are paid for their produce.

The chemical engineering problems examined were mainly connected with design and layout of factory water-treatment plants and the initiation of a satisfactory treatment, fuel and boiler problems, cooling of milk and cream, refrigeration capacity, and can- and bottle-washing detergency.

PUBLICATIONS.

The following papers were prepared for publication:—

(1) *Value of the resazurin test for the determination of milk quality.*—The ten-minute and one-hour resazurin tests were compared with the methylene blue test, the plate count, the direct microscopic count and the leucocyte count. The resazurin tests investigated exhibited no marked advantages over the modified methylene blue test.

(2) *Evaluation of the practical performance of a quaternary ammonium compound and a hypochlorite as germicidal agents.*—The quaternary ammonium compound and a hypochlorite compound were evaluated practically by means of the Weber-Black method. The hypochloride compound was found to be superior to the quaternary ammonium compound tested.

(3) *A laboratory whirler for determining counts of thermoduric organisms.*—A laboratory whirler which permits the rapid performance of thermoduric counts on milk was described. The method is faster and more convenient than the orthodox roll-tube count, and yet retains all the advantages of roll-tube counting.

(4) *Seasonal variations in the composition of milk.*—Wide seasonal variations in the chemical composition of milk are reported. The most conspicuous change in composition was recorded in the late-winter and early-spring months, when pastures were poor. It is also deduced from herd-recording data and from seasonal variation in the cheese-yielding capacity of milk supplied to cheese factories that the trends in composition apply in most dairying districts in Queensland. The evidence suggests that variations in milk composition are largely due to changes in the nutritive value of pastures.

(5) *Market milk control in Queensland.*—The expansion of the market-milk industry in Queensland has resulted in the extension of bacteriological testing in the State. An outline of the main tests employed is given and some comments on the future of bacteriological testing in the market-milk industry are made.

(6) *The use of sodium oleate as an inhibitor for a quaternary ammonium compound.*—The use of sodium oleate as an inhibitor for a quaternary ammonium compound in bacteriological work is reported.

(7) *The maintenance of phage-free cheese starter cultures.*—The paper presented a survey of cheese-starter methods in this State, and included all information so far obtained on the subject. Starters and bacteriophage are discussed, together with equipment for culturing, propagation techniques, bacteriophage tests, source of bacteriophage infection, bacteriophage behaviour in the cheese vat, methods of bacteriophage control, and manufacturing methods for phaged vats.

(8) *A method for determining the moisture distribution in butter and a review of its applications.*—The microscopic method outlined shows how the degree of butter-working can be more accurately determined, and its practical applications are reviewed.

(9) *The neutralisation of cream.*—Modern trends in the neutralisation of cream are discussed.

DIVISION OF MARKETING.

MARKETING BRANCH.

Mr. H. S. HUNTER, Director of Marketing.

MARKETING.

General.—During the year, officers of the Marketing Branch have been occupied with duties necessary in connection with the activities of the Council of Agriculture, with the supervision of boards operating under the various marketing and co-operative Acts, and in providing information and advice to the Department in relation to the economics of the agricultural industries concerned.

The Acts administered in the Branch are the following:—

The Primary Producers' Organisation and Marketing Acts, 1926 *to* 1951.

The Wheat Pool Acts, 1920 *to* 1930.

The Fruit Marketing Organisation Acts, 1923 *to* 1945.

The Primary Producers' Co-operative Associations Acts, 1923 *to* 1934.

The Dairy Products Stabilisation Acts, 1933 *to* 1936.

The Second-hand Fruit Cases Act of 1940.

The Peanut Industry Protection and Preservation Acts, 1939 *to* 1941.

In the course of these duties problems have arisen which have had bearing not only on the domestic affairs of the marketing organisations themselves but also on allied industries. This has demanded from officers a sound general appreciation of financial, economic and legal affairs, to assist in the formulation of appropriate action.

A detailed statistical and descriptive account of the activities of the various marketing boards (of which the Director is *ex officio* a member) will as in previous years be given in *The Annual Report by The Director of Marketing* as required under *The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1951.

While the tempo of the inflationary trend slackened towards the close of the period, the continued rise in costs was, as in the previous year, a major problem in board administration. This is reflected in the widening margin between gross and net returns, which provides an incentive for growers to evade delivery and so aggravates the cost burden for loyal growers.

During the year the production of some commodities was not in sufficient quantity to meet the State demand. The increasing local demand from a growing population proved, in some instances, to be greater than could be satisfied by production seriously limited by one of the worst droughts in our history. To meet the requirement of stock-feeders, wheat had to be imported from South Australia, and the restricted supply and increased transport costs had a secondary effect on the production of stock feeders. Butter, cheese, milk and eggs had also to be imported from other States at various periods to maintain supplies, at times rationed by necessity.

In the midst of these reverses the vulnerability of the nation's economy, dependent so much on one exportable commodity—wool—was made strikingly evident. For 1951-52, Australia's wool exports amounted to £323,799,000 and represented 48 per cent. of the total value of all exports for the year. In comparison, the corresponding figures for 1950-51 were £633,344,000 and 64.5 per cent. respectively. The adverse balance of payments following this fall in wool values has concentrated attention on the urgency for building up exports of other commodities to assist the nation to meet its import requirements.

A brief review of major marketing developments in some of the industries in respect of which statutory boards have been established under the abovementioned legislation follows.

The Dairying Industry.

A striking trend in the dairying industry, particularly during the post-war years, has been the increasing diversion from butter and cheese manufacture to milk for wholemilk consumption or for the manufacture of processed milk products. Accordingly, the drain from butter and cheese suppliers during the drought months of the year under review to maintain liquid milk distribution (at times rationed), together with the fall in the quantity of milk produced for butter and cheese manufacture itself, had a serious effect on the production of the last two commodities. This is evident when it is realised that total butter and cheese production during 1951-52 amounted to only 1,113,979 boxes and 10,527,964 lb., being respectively falls of 41% and 44% on 1950-51 figures, and that to relieve local shortages during the drought months Queensland had to import quantities of butter and cheese from southern States. As would be expected, exports of butter and cheese, both interstate and overseas, fell far below the level of the previous year. The overall picture is given graphically in Fig. 1 by a comparison with the two previous years.

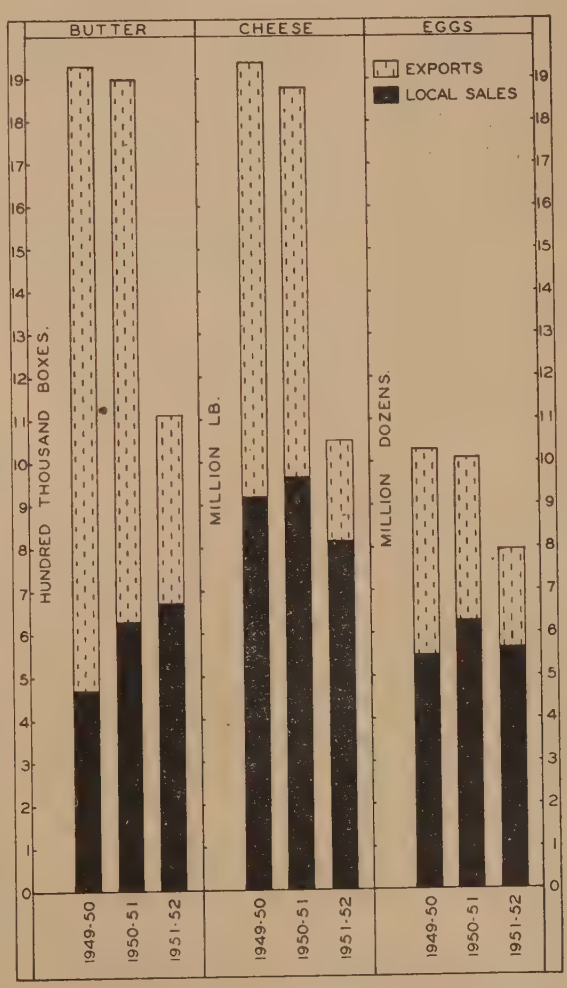


Fig. 1.

RECEIVALS AND DISPOSALS OF QUEENSLAND PRODUCTION OF BUTTER, CHEESE AND EGGS BY THE BUTTER, CHEESE AND (SOUTH QUEENSLAND) EGG MARKETING BOARDS DURING THE THREE YEARS 1949-50 TO 1951-52.—The graph does not show quantities of butter, cheese and eggs imported by the Boards from other States during 1951-52, which amounted to 25,000 boxes of butter, at least 2,300,000 lb. of cheese and 108,355 dozen eggs. Queensland cheese processed for the Australian market has been included in local sales, as most of this cheese would be consumed in Queensland. An actual dissection of sales between Queensland and other States is not available.

The Egg and Poultry Industry.

Although substantial increases in the contract price for eggs in shell from 2s. 7d. to 3s. 3d. per dozen (15 lb. pack) and from 2s. 0.375d. to 2s. 4.75d. per lb. in the case of egg pulp—equivalent to 25% and 18% respectively—were negotiated prior to the 1951-52 export season, primarily as an incentive to increase shipments to the United Kingdom, it soon became evident that any benefits were rapidly being absorbed by increased production and marketing costs. Consequently, as with dairy products, export has been subsidised by high domestic prices, although in the case of butter and cheese the domestic price has been substantially relieved by Government subsidy. The repercussion of the high local price has already been evidenced in sales resistance, and buyers have cut their purchases and/or turned to substitute or alternative foods.

The industry suffered a further reverse during the year as a result of the collapse of the United Kingdom market for poultry meat. To this was added the burden of increased costs consequent upon the necessity of importing feed wheat from South Australia, and an increase in the feed price following the amendment to the wheat stabilization legislation. As a result of these two factors, the bulk price was increased respectively from 7s. 10d. to 11s. 7d. per bushel from September 18 to November 30, 1951, and to 12s. per bushel subsequently. In addition, the Australian Wheat Board refused to meet freight costs on one shipment from South Australia during April 1952 and a resultant increased price of 15s. 9d. per bushel had to be met by Queensland consumers of the 5,833 tons involved. Prior to the importation of wheat a shortage of grain caused much concern and uncertainty, with the result that flocks were reduced, and numbers sent to poultry abattoirs reached record proportions.

In view of the above it is not surprising that during 1951-52 production in southern Queensland, as reflected in receivals by the South Queensland Egg Marketing Board, fell in comparison with 1950-51 from 10,105,534 dozen to 7,957,992 dozen, equivalent to 21%, while exports also declined correspondingly.

A comparison of receivals and disposals of eggs by the South Queensland Egg Marketing Board in each of the three years 1949-50, 1950-51 and 1951-52 is given in Fig. 1.

The Grain and Allied Industries.

Much attention has been focussed on the grain industries during the past 12 months owing to the drastic fall in export income brought about by the fall in wool prices and the general decline in Australian wheat acreages. The grain industries provide the greatest scope for rapid expansion in order to relieve this situation. Queensland is not a major grain-producing State and at present accounts for only about 6% of the total acreage of grain and seed crops in Australia. However, in contrast to other States, where grain acreages have been declining during the last few years, the area under grain and allied crops in Queensland has been expanding steadily since the end of the war, and although seasonal conditions have on occasions greatly reduced crops, and the rate of expansion has slowed down during the last three years, there has been no suggestion of a decline.

Under Queensland conditions, particularly since the development of the grain sorghum and linseed industries, there is a noticeable tendency for farmers to change from one grain crop to another if seasonal conditions are not favourable to the crop they have been growing or if relative profitability levels favour another crop. This tendency has been most marked during the present season, when weather conditions have not favoured maize and grain sorghum and there has been a substantial change to wheat. Consequently, it is desirable from the standpoint of development and marketing economics that these industries should be viewed as a whole. The total area under grain, seed, hay and green fodder crops, which are more or less competitive as regards land usage and farmer attraction in Queensland, increased from approximately 1,200,000 acres in 1938-39 to 1,300,000 acres in 1944-45 and 1,579,000 acres in 1950-51—a net post-war increase of over a quarter of a million acres in six years. The most rapid expansion has been in wheat, grain sorghum and linseed acreages, which occurred partly at the expense of green fodder crops.

Fig. 2 illustrates the expansion which has taken place in these crop categories since 1938-39.

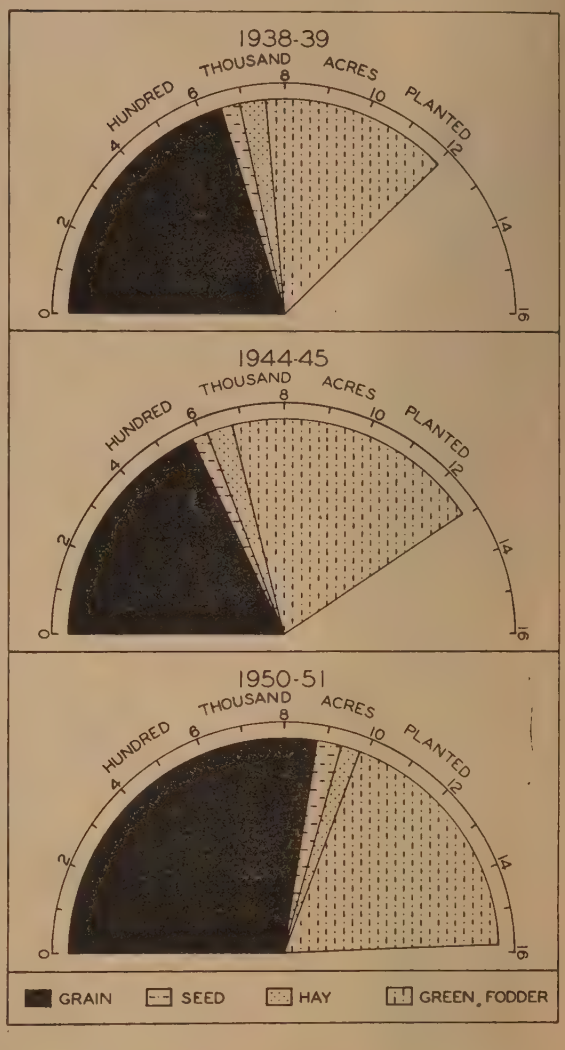


Fig. 2.

COMPARISON OF AREAS UNDER GRAIN, SEED, HAY AND GREEN FODDER CROPS IN QUEENSLAND, 1938-39, 1944-45 AND 1950-51.

Despite the increased acreages revealed above, Queensland's feed grain production was insufficient to meet consumption requirements during the year, and over 3,000,000 bushels of wheat were imported to June 30 from South Australia to meet the requirements of stock-feed users. This position was brought about by two factors. Firstly, the poor season reduced the 1951-52 wheat crop to about 6,600,000 bushels, compared with an average of 11,627,000 bushels for the previous three years; and secondly, grain consumption, which in this State has been increasing quite rapidly during the post-war period, was further enlarged by drought conditions in many areas. Present annual grain consumption in Queensland is estimated at about 14,000,000 bushels, of which about 7,500,000 bushels are used as stock feed. Of the total grain consumption, wheat normally accounts for about 10,000,000 bushels, the balance being made up of grain sorghum, maize, oats and barley.

With present acreage levels and average yields, Queensland should generally produce sufficient wheat for its consumption needs and might also be expected to produce an annual surplus of about 2,000,000 bushels of other feed grains.

There would, of course, be many years in which the surplus would be considerably greater. However, on the other hand, the fairly regular occurrence of years when production will be below consumption requirements can be expected. This is particularly so in the case of wheat, where the present acreage level is just sufficient on the average to meet consumption needs.

There appears little likelihood at the present time that increases in production in the immediate future will, on the average, do much more than neutralise increases in consumption. This would seem to indicate the desirability of allowing for substantial carry-over stocks of grain (particularly wheat) from each harvest until the following harvest is assured before export is undertaken. Such a step would, however, be difficult with present limited storage facilities in Queensland.

The Tobacco Industry.

The rapid expansion of the tobacco industry in Queensland from 1,678 acres in 1948-49 to an estimated 5,200 acres in 1951-52 has given rise to a number of marketing and economic problems which have required constant attention during the past 12 months. The estimated 4,500,000 lb. of leaf produced from the 1951-52 crop is more than double the previous season's harvest and some difficulty has been experienced in making selling arrangements suitable to manufacturers and to The Tobacco Leaf Marketing Board and its agents. Buyers for the major manufacturers are at present required to appraise crops in Victoria and Western Australia as well as Queensland. It is becoming increasingly evident, as Queensland's production increases, that this will no longer be possible, and it will soon be essential for manufacturers to operate special teams of buyers in Queensland alone, with separate teams for other States. Under the present method of sale by auction it will not be long, if expansion continues at its present rate, before auction floors in this State will need to be open continuously for buyers' inspection during the selling season.

There is nothing fundamental in the present economic situation to prevent continued expansion of the tobacco industry. However, limitations are imposed on the possible rate of expansion by availability of irrigation facilities, shortage of materials and farm capital, and the lack of experienced farmers, experienced labour, housing and amenities.

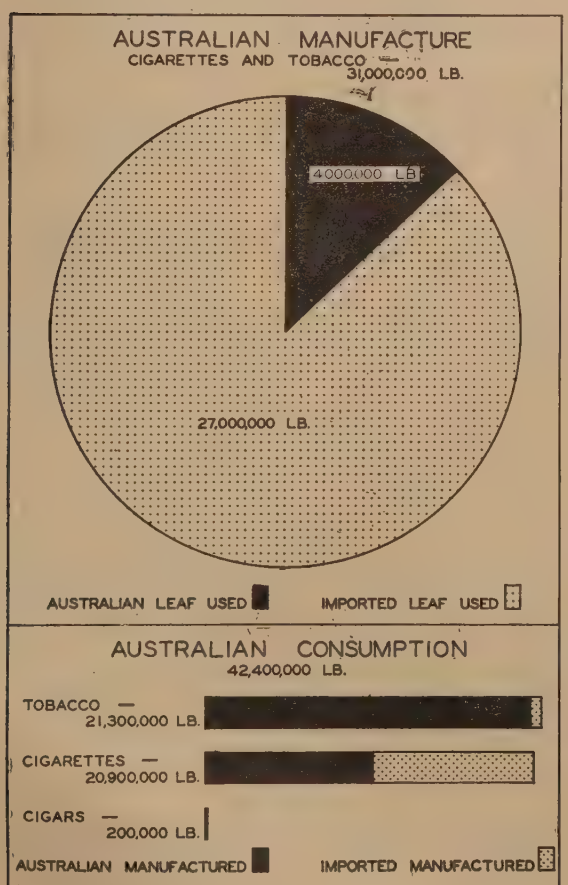


Fig. 3.

Australian and Imported Tobacco Leaf Used in Manufacture, and Australian Consumption of Local and Imported Manufactured Tobaccos, 1950-51.

Whether or not expansion will proceed at its present steady rate will depend largely on the stability of prices at a profitable level for all usable leaf. Following last year's record high prices for all grades of leaf, prices during the 1952 series of auctions have fallen somewhat and difficulty is being experienced in disposing of much of the leaf. The fall in prices is greater on the middle and lower grades than on the higher grades. Some 19% of leaf offered in North Queensland remains unsold, while about 37% of southern Queensland leaf offered has not been sold. Although a fair percentage of unsold leaf is of low grade, there is nevertheless a substantial quantity of middle-grade leaf and some of the higher grades unsold, and it is the non-sale of these latter grades which is of most concern to the industry. The difficulty in selling the lower grades of leaf can be attributed largely to the much greater crop and financial and other limitations of smaller manufacturers, who normally buy much of this type of leaf. However, the only apparent explanation for the non-sale of quantities of the better grades of leaf is the general lack of competition and the ease with which the large companies using imported leaf have been able to obtain the requisite percentages of Australian leaf to qualify for the reduced tariff.

Fig. 3 shows the approximate relationship which existed last year between Australian leaf used in the manufacture of cigarettes and tobacco and the total output of Australian tobacco factories. The chart also shows the proportions of Australian consumption of tobacco, cigarettes and cigars which are manufactured in Australia.

The overall position of Queensland's tobacco industry in the light of present difficulties is that although the industry is still undoubtedly profitable for most growers, some individual growers have been seriously affected and there is a general air of uncertainty as to the future. This uncertainty is likely to severely limit expansion in what would otherwise be a steadily expanding industry.

Minor Crops.

The most significant contrast between pre-war conditions in agriculture and those of the present day is in the supply of rural labour. Before the war the prices of basic agricultural commodities were rather depressed and there was an ample supply of rural labour. The post-war picture has been one of strong demand for basic commodities, particularly grains, and a definite scarcity of rural labour.

In these conditions growers have tended to concentrate on those crops which lend themselves to mechanisation, and to pay less attention to those which require much labour.

The accompanying graph (Fig. 4) shows how this tendency has affected the acreages planted to arrowroot, broom millet and ginger. The acreage planted to the first two crops has shown a marked decline, while the expansion in ginger plantings which took place during the war and immediate post-war years is now contracting. Some expansion in these industries may occur if prices rise greatly in relation to those of other crops, but such rises would probably cause substantial reductions in demand or stimulate the search for local or imported substitutes or alternative sources of supply.

The contraction in these crops has caused many problems for the Boards associated with these industries, because marketing problems are often as acute in times of shortage as in times of over-supply. Reduced turnovers lead to higher handling costs per unit and the increased costs tend to discourage expansion.

High prices of local arrowroot stimulated the demand for imported starch flours and local substitutes. As a consequence, the demand for arrowroot flour has definitely weakened and the price has declined. Ginger grown and processed in Queensland has also had to face increasing competition from high-quality imported ginger. Despite greatly reduced production, the Board has experienced great difficulty in marketing its product, which is processed by The Buderim Ginger Growers' Co-operative Association Ltd. However, the imposition of import restrictions is expected to lead to an expansion of local sales and possibly to increased plantings.

In an endeavour to give the industry protection from the imported commodity, the Ginger Marketing Board made representations to the Commonwealth Government for a reduction in sales tax, but it was suggested that the industry should rather seek protection through an import tariff. The Board is proceeding with the preparation of a case for submission to the Tariff Board.

Broom millet plantings have shown a downward tendency over the past 10 years; but, under the stimulus of rising prices, which reached as high as £250 per ton last season, plantings for the current crop have shown a considerable increase. Whether this expansion in acreage will be maintained will no doubt depend largely on price trends, because this industry requires a large degree of hand labour, which is at present at a premium in Queensland agriculture.

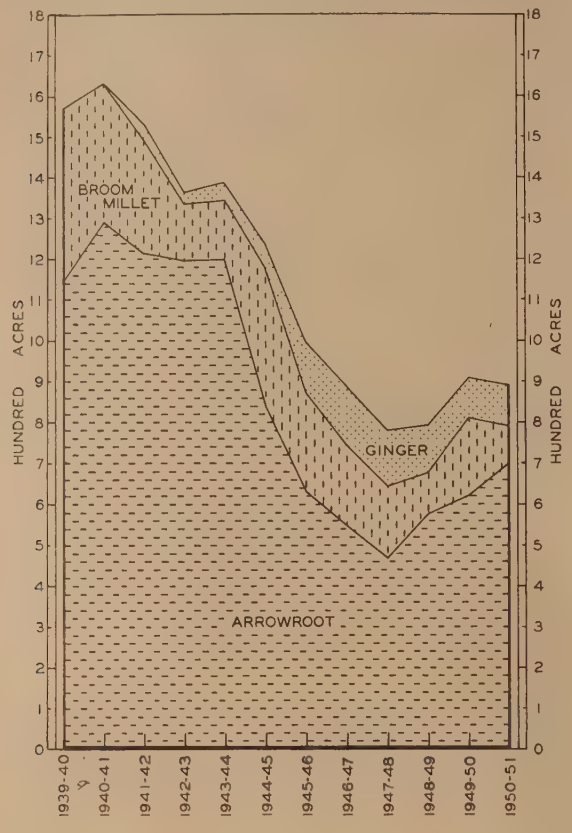


Fig. 4.

AREA PLANTED IN QUEENSLAND TO ARROWROOT, BROOM MILLET AND GINGER, 1939-40 TO 1950-51.

Fruit and Vegetable Growing.

In contrast to the previous year, when the factory outlet proved an important means of absorbing heavy production in most kinds of fruit, the year under review was characterised by marked shortages. The prolonged drought and extremely cold winter greatly reduced production of tropical fruits, notably pine-apples and bananas, while their effect on the citrus crop is being felt mainly in the current season.

On the Granite Belt two severe hailstorms caused extensive damage in deciduous fruits, notably apples. Growers on the northern end of the Granite Belt are covered by a Hail Insurance Scheme operated by the C.O.D. They received compensation at the rate of approximately 2d. per bushel. As a consequence of the general shortage, sales of hail-marked fruit realised good market prices.

Because of the adverse seasonal conditions mentioned above, prices of most fruit and vegetables, other than apples which have been instanced, remained high during most of the year and reached unprecedented levels during the latter half of 1951. At this stage an unusual feature was witnessed when substantial quantities of vegetables were imported from southern States at a period when these are normally being exported. However, the breaking of the drought and some clearly defined buyer resistance resulted in a big drop, particularly in vegetables, which late in the Stanthorpe season were difficult to dispose of.

The expansion of the fruit industry in Central Queensland has been one of the most important developments of recent years. For some time there has been an agitation by growers in that area for the establishment of a cannery. After a great deal of investigational work through the Committee of Direction of Fruit Marketing, it was decided to erect a factory at Koongal, near Rockhampton. Work is now well under way and it is hoped that the factory will be sufficiently near completion to begin processing the local pine-apple crop next summer.

The supply of new case shooks improved greatly during the year; there were substantial increases in prices, although towards the close of the year there were signs of some millers under-cutting list prices. The cost of the container has now become such an important item of marketing expense that growers generally are endeavouring to devise some plan which will reduce the proportion of this item in their general costs. To help overcome the problem a second-hand cases scheme was introduced as a wartime measure by *The Second-hand Fruit Cases Act of* 1940; it has continued in operation ever since. In accordance with the Act, a Committee representing both grower and merchant interests and the Department of Agriculture and Stock through the Director of Marketing supervises the activities of licensed dealers who collect and distribute second-hand fruit cases. By this means well over one million cases a year have been returned to the industry at relatively small cost. The popularity of this scheme among growers has led to requests for its extension to other areas, and economic aspects of such a move are being investigated. Arising also from the high container cost, a strong advocacy has developed among growers for some scheme whereby a separate charge would be made for the container. This custom is already well established in connection with the sale of certain other commodities and growers feel that a similar practice should apply in the fruit industry. However, there are many problems associated with such a proposal and no finality has yet been reached in this matter.

In North Queensland there has been a promising expansion of the fruit industry. The problem of this area has been in the past not one of production but of economical marketing. A further step towards the solution of the problem was taken by growers during the year with the commencement of production in Cairns by The Great Northern Co-operative Cannery Association Ltd., with the assistance of a guarantee from the State Government.

The Potato Industry.

Despite the serious drought throughout the second half of 1951, potato production in Queensland reached normal expectations because most potatoes in this State are grown under irrigation.

Commencing with the 1951 autumn crop, The Potato Marketing Board took over the distribution function in southern Queensland. Previously the Board had relied on selling agents to carry out the receiving and selling of the crop. This arrangement still operates in respect of the relatively small North Queensland crop, but in the south the Board receives, sells and pays for the crop, which is disposed of to wholesale merchants. In Brisbane these functions are carried out by the Board's own staff or under its immediate supervision, but in country centres agents receive and distribute potatoes under direct instructions from the Board.

During the summer The Potato Marketing Board again undertook the cold-storage of portion of the surplus intake. In the previous year approximately 11,000 bags had been carried successfully in cold-storage. On this occasion the Board placed 25,928 bags in cold-storage. Of this quantity, after allowing for deterioration and losses in picking over, 25,334 bags were sold for human consumption, while most of the remainder was sold as stock-feed. However, apart from actual losses through deterioration, the loss of weight through shrinkage exceeded 56 tons, or approximately 3.3%. After taking account of the expenses involved and the losses experienced, the overall cost of storage was approximately £7 10s. per ton.

STATISTICS.

Statistics play an important part in the administration of rural industry, and the Statistical Section of the Marketing Branch is responsible for the provision of such statistics as may be required from time to time by the Departmental administration.

Statistics are indispensable for the objective description of an economic problem, and in considering the likely effects of a proposed course of action.

Statistics play a vital part in the formulation of marketing policy, and as marketing is the end of all production, in the formulation of production policy. Much attention is at present being devoted to the problem of increasing food production. Recognition, description and analysis of the problem are dependent on statistics.

Effectively to discharge its duties in relation to statistics, the Marketing Branch must keep abreast of statistics on all levels from the international down to at least local authority areas within the State. Statistics from the recognised secondary sources are readily available in the branch. In addition, the Marketing Branch is a source of much primary data, through its connection with Marketing Boards and other organisations as well as through the Market Price Reporting and Crop Reporting and Forecasting Services.

Recording, analysing and filing this type of data is proceeding constantly, and is limited only by the availability of staff. Two surveys which have been receiving attention during the year are specifically mentioned. One relates to an analysis of prices received for various grades of tobacco leaf over the last few years and the appraised values with a view to ascertaining generally whether the quality of the leaf is improving or not, and whether such variations in quality are commensurate with prices received.

An analysis of market prices of a series of crops is also proceeding, the object being to establish the general pattern of price fluctuations for each crop and interpret it in relation to the causal factors.

Crop Reporting and Forecasting.

The Crop Reporting and Forecasting Service issued reports during the year in connection with the wheat, barley, maize, grain sorghum, peanut, tobacco, and the spring and autumn South Queensland potato crops. Consideration has also been given to the periodical issue of a report on trends in the egg and poultry industry. In the present uncertain state of this industry it is considered such a report is well warranted. Preliminary statistics are being collected, but the limited nature of those available will present some difficulties. The available data, however, are being analysed and a *modus operandi* is being formulated which, as a result of the operation of a different set of factors, must be somewhat different from that employed in respect of agricultural crop forecasting.

Forecasts are made on the basis of information supplied by selected farmers, known as honorary crop correspondents, who are located in the important growing centres.

Before an estimate can be made of production, it is necessary to estimate both the area under crop and the prospective yield per acre. Both of these subsidiary estimates present problems in the early formative years of a Crop Forecasting Service.

Calculation of area is made by means of comparison with the previous season's area. The crop correspondent reports the percentage variation in acreage which he estimates has occurred in his immediate locality, as compared with the previous season. The rate of variation reported in this way is substantially accurate but the area estimated tends to be less accurate than the rate of variation. This is because of the lapse of time which occurs between the completion of the harvest and the publication of that season's statistics by the Government Statistician. Returns of agricultural production are collected on March 31 each year, and statistics are not available until August at the earliest. With winter-growing crops such as wheat and barley, the previous season's results are not known at the time of the first report, although they are generally known before the final forecast. With summer-growing crops, however, the collection date occurs during the progress of a crop. The figures collected at this date are therefore the final figures for the previous season's crop.

This means that statistics for the crop immediately preceding the crop for which the forecast is being made are never available, and that the rate of change in area can be applied only to the estimated area for the previous year, with the result that in the cases of grain sorghum and maize, for example, each acreage forecast accumulates errors in estimation for two seasons. There appears to be no ready solution to this problem. Comparison with the crop prior to the last, instead of the last crop, would almost certainly produce a greater proportion of errors in crop correspondents' estimates.

Estimates of prospective yields per acre are calculated from crop correspondents' estimates of average yields in their localities. The tendency has been for these to show an upward bias, but it will be impossible until data for several more seasons are available to employ any statistical technique to calculate the probable bias. In the meantime, reported yields are adjusted in accordance with seasonal prospects after reference to recorded yields in similar seasons.

A system in use in other countries, whereby prospective yields are calculated from a reported crop condition based on the concept of "normal," has never been used in Queensland, mainly because it was felt that farmers would have difficulty in visualising a "normal" crop. However, as the estimates of actual yields are in themselves unreliable and as data have not yet been accumulated over a sufficiently lengthy period to provide a statistical corrective device, it is proposed to introduce the "normal" concept during the coming year. Results will be studied in conjunction with actual estimates and will provide useful comparative data in years to come. While these data are being accumulated, however, there appears to be available no better method of yield determination than that at present in use.

Publication of the monthly *Report on Production Trends* continued throughout the year. The form of presentation remains basically the same as for previous years, only minor improvements having been effected.

This periodical contains a monthly review of conditions in all rural industries and it is proposed to introduce during the coming year studies of price trends of certain commodities. Every effort is made to have this report available for distribution by the middle of each month, summarising conditions as at the end of the previous month. The *Report on Production Trends*, containing a wealth of information of a general nature, enjoys a wider distribution than the crop reports, which have a more specialised appeal.

Market Price Reporting.

There is an increasing demand for the information collected, recorded and disseminated by the Market Price Reporting Service. The media used for the distribution of this information are *The Daily Official Market Quotations* and *The Weekly Market Report*.

The former is not confined to price quotation alone but also embraces a commentary dealing with quantities, qualities and demand for all varieties of fruit, vegetables and farm produce from both interstate and intrastate sources. Growers, traders and consumers are in daily touch with the state of the markets by means of the radio, press and postal services. This enables those dependent upon the markets for their livelihood to exercise discrimination in supply and purchase.

Large institutions under Commonwealth, State or private control being supplied under contract rely upon the report and use it as the arbiter in cases where disputes arise. It is usually the stipulated basis for contract costing and is accepted as such by Army, Navy and Air Force establishments, migrant holding-depots and hostels, etc.

The Weekly Market Report concerns itself with the broader aspect of supply and disposal and gives an overall picture of the weekly trading together with criticism and comment designed to be of benefit to the supplier. This report is embodied in the country press and in growers' periodicals.

The statistical data so collected and collated are now sufficient to enable graphical presentation of cyclical price movements for various commodities. As mentioned earlier in the report, it is anticipated publishing this information in the *Report on Production Trends*.

GENERAL.

As a consequence of their activities in connection with various marketing boards, officers have been associated with a variety of problems engaging the rural industry which each Board represents or with which it may be allied. Some of these matters are dealt with hereunder.

Increased Food Production.

The Branch has to an increasing extent been associated with the drive for increased food production, which has now become a matter of national concern. In addition to analysing recent production trends and the economic factors operating in the various rural industries with a view to establishing potential developments, reports and suggestions by other authorities have been critically examined.

Bulk-Handling of Wheat in Queensland.

Following last year's preliminary investigations, a committee comprising representatives of the Department of Agriculture and Stock, the Treasury Department, the Railway Department, the Co-ordinator General of Public Works and the State Wheat Board was set up. Sub-committees were appointed to examine various aspects of finance, distribution of facilities, transport, and the production and consumption of wheat in this State. The Division of Marketing is represented on the main committee and each of the sub-committees.

During the year detailed reports on the potential and probable increase in production and likely changes in consumption during the next 5- and 10-year periods have been prepared and an interim report has been prepared on the distribution of bulk-handling facilities and associated transport problems.

Action has been taken by the State Wheat Board to have plans and estimates drawn up for a terminal of 500,000 bushels capacity at Pinkenba. In the meantime, arrangements have been made to convert a storage shed at Pinkenba for bulk-storage to assist in the handling of possible export from the expected large crop during the coming season. Arrangements are also being made to test the possibilities of bulk-storage on the Downs.

Wheat Industry Stabilisation.

To encourage expansion in the wheat acreage, agreement was reached between the State and Commonwealth Governments to increase the home consumption price of wheat for stock-feed by 2s. per bushel above the determined cost of production of 10s. per bushel for the 1951-52 cereal year. In addition, the Commonwealth Government undertook to pay a subsidy of 4s. 1d. per bushel on such wheat up to a maximum of 26,000,000 bushels for the year. The agreement was subject to the Australian Wheat Board meeting the cost of transporting wheat to Queensland and Tasmania, where production was insufficient for local consumption.

The scheme operated satisfactorily from the Queensland point of view until April 1, 1952, from which date the Australian Wheat Board refused to meet the shipping freight incurred in transporting wheat from Adelaide to Brisbane, equivalent to 3s. 9d. per bushel. On May 10, 1952, the Queensland Government suspended the operation of a section of the 1951 legislation, thus forcing a price reduction of 2s. per bushel in this State, and the suspension of the Comonwealth subsidy of 4s. 1d. per bushel throughout Australia. Following further conferences between State and Commonwealth authorities, and between the Commonwealth Minister and representatives of Australian wheatgrowers' organisations, it was agreed that Queensland would lift its suspension of the relevant section of the stabilisation Act as from June 28, 1952, and that the Commonwealth would pay the freight to Queensland and Tasmania out of moneys not paid to the Australian Wheat Board by way of subsidy during the period of suspension.

Maize Export.

For the 1951 crop the Maize Growers' Co-operative Association of Southern Queensland Limited organised a voluntary Pool on the same lines as in previous years. In view of the drought which continued in Queensland throughout the year and the fact that towards the end of the year the State was relying for feed grains upon shipments of wheat from South Australia, this Department did not support applications for export permits. The Pool claimed it could not dispose of the maize on the local market, but it was found that the factor preventing sales was the high price being asked by the Pool. Early in 1952, however, the Commonwealth Government agreed to permit the Pool to export 1,000 tons.

The Atherton Tableland Maize Marketing Board, with a crop of 12,000 tons, also made application for an export permit. Because of the Atherton maize area's geographical isolation and the high cost of freight to southern markets, some relief in the form of export was warranted and recommendation was made accordingly after the Marketing Division had assisted the Board to place maize in drought-affected areas of southern Queensland. The Commonwealth Government granted approval for the export of 2,500 tons.

Standing Advisory Committee on Tobacco.

The Director continues to act as a member of the Standing Advisory Committee on Tobacco. The committee, which comprises representatives of the Department of Trade and Customs, the Department of Commerce and Agriculture, C.S.I.R.O., Departments of Agriculture of the four tobacco-growing States, tobacco growers, and manufacturers, has been established in accordance with a decision of the Australian Agricultural Council. One of the main functions of the committee is the making of recommendations to the Commonwealth Government regarding percentage of Australian leaf to be included in Australian manufactures of tobacco in order that manufacturers may qualify for concessional duties on imported leaf.

PRIMARY PRODUCERS' CO-OPERATIVE ASSOCIATIONS.

Although no new associations were registered during the year, a number of associations amended their rules, most of the amendments being designed to enable the associations concerned to obtain additional capital.

Prior to 1942, when the States vacated the field of income taxation by surrendering their powers to the Commonwealth, many associations enjoyed complete exemption from the payment of State income tax by including provisions in their rules prohibiting the payment of dividends on share capital and distributing profits to members in the form of rebates or bonuses based on the quantity of produce supplied by members.

Since the Commonwealth assumed the exclusive right to levy income tax, the non-payment of dividends has been of no advantage in obtaining taxation concessions, and the trend has been to revert to the payment of dividends so that members might obtain some return on profit distributions made in the form of bonus shares instead of in cash.

This trend has become particularly evident in the last few years, when steeply rising costs have made it imperative for associations to obtain extra capital, and the distribution of profits, either wholly or partly, in the form of bonus shares has become more general.

The Registrar of Primary Producers' Co-operative Associations has been appointed to represent the Department on the Co-operative Advisory Council which was set up during the year under *The Co-operative Societies Act Amendment Act of* 1951. The general function of the Council is to promote and encourage co-operation and to assist both in the formation of new co-operatives and in the improvement and development of existing co-operatives.

STANDARDS BRANCH.

Mr. F. B. Coleman, Standards Officer.

Curtailment of activities has been necessary during the year due to the shortage of staff.

During the year, 320 sellers of agricultural requirements were visited, against 433 in the previous year. Inspections covering the whole coastal area from the New South Wales border to the Atherton Tableland were made.

SEED ANALYSIS.

Table 1 sets out details of seed samples examined at the Brisbane Seed Testing Station. The samples

TABLE 1.

SUMMARY OF SEED SAMPLES EXAMINED.

	1950–51.	1951–52.
Samples received from—		
Inspectors of Branch ..	4,423	4,327
Seed Certification Officers ..	190	221
Sellers	2,226	2,257
Buyers	148	155
Government Departments ..	1,658	1,276
Experimental test samples ..	238	467
Total samples examined ..	8,883	8,703
Germination tests carried out ..	9,740	10,490
Inspectors' samples failed to comply—		
(i.) Farm seeds—		
(*a*) Low germination ..	99	100
(*b*) Purity	164	315
(ii.) Vegetable seeds ..	310	274
(iii.) Packeted seeds ..	..	15

received from inspectors were slightly less numerous than last year; however, 618 samples of Rhodes Grass seed were examined, against 336 in the previous year.

No doubt due to increased publicity, buyers of seeds are more frequently availing themselves of the free service for the examination of samples representing seeds which they have purchased for their own sowing. Prior to 1949, the largest number of samples submitted in one year was 64; for the last two years it was 148 and 155 respectively. Nevertheless, considering that it costs in the vicinity of 12s. 6d. per sample for a purity and germination test, the response to this free service to the farming community is regrettably small; unless, on the whole, buyers of seeds are well satisfied with the quality available.

Table 2 sets out details and comparisons with the previous year's work relative to action taken with seeds found not to comply with the Acts' requirements.

TABLE 2.

ACTION TAKEN ON UNSATISFACTORY SEEDS.

	1950–51.	1951–52.
Cleaned under supervision of an inspector—		
Farm seeds ..	244 bags	244 bags
Destroyed or otherwise rendered unsuitable as seeds—		
(i.) Farm seeds ..	2,468 bags	370 bags
(ii.) Vegetable seeds	12,203 lb.	2,285 lb.
(iii.) Packeted seeds	..	5,757 pkts.

The principal prohibited seeds found in samples taken by inspectors and the number of times they occurred were as follows:—

Carthamus lanatus (saffron thistle) ..	3
Cuscuta spp. (dodder)	1
Datura spp. (datura, thornapple) ..	25
Ipomoea spp. (bell vine)	32
Melilotus indica (Hexham scent)	23
Rapistrum rugosum (turnip weed) ..	48
Salvia reflexa (mintweed)	170
Silybum marianum (variegated thistle) ..	9
Sorghum halepense (Johnson grass) ..	2
Verbescina encelioides (wild sunflower) ..	14
Insect infested seeds	10
Sorghum in Sudan grass	29

Restricted weeds (that is, those whose presence is permitted only in specific numbers per oz. or per lb.) found in inspectors' samples were as follows:—

Alternanthera repens (khaki weed) ..	7
Argemone mexicana (Mexican poppy) ..	12
Cirsium lanceolatum (spear thistle) ..	6
Echium spp. (bugloss)	3
Emex australis (spiny emex)	1
Lithospermum arvense (corn gromwell) ..	2
Marrubium vulgare (horehound)	6
Polygonum spp. (wireweed)	82
Sisymbrium spp. (wild mustard)	11

Greater care by all concerned is needed if these objectionable seeds are to be eliminated from seeds being sold for sowing.

SEED STORAGE.

In tropical and subtropical countries considerable losses are experienced through failure of seeds to retain their viability during various periods of storage. Queensland, which lies within the 11th and 29th parallels of latitude, has tropical and subtropical conditions.

In order to obtain information relative to this important matter, two 2-year periods of storage of vegetable seeds under different conditions were undertaken. The results of the first period indicated that storage in air-tight tins under all conditions of storage enabled seeds to retain their germination most favourably.

In the second 2-year period, just concluded, the methods of storage of vegetable seeds included air-tight tins, chlorinated rubber packets, waxed cellulose packets and linen bags each with and without selica gel, such containers being stored at Stanthorpe (situated in a temperate zone in a brick building), Brisbane (with subtropical conditions, in a brick building, a florist's shop and a household refrigerator) and Cairns (under tropical conditions in a brick building and in wet refrigerator storage).

The experiment has revealed that the ideal storage conditions are those of dry refrigeration. Where this is not available, the next best is normally dry, cool storage, such as would prevail at Stanthorpe; failing this, an airy brick building in Brisbane is suitable for the storage of seed, particularly in air-tight containers such as tins. The moist conditions which prevail in shops or stores where water or plants are present or in tropical areas such as Cairns, or even in a moist refrigerator, are most unsuitable for the storage of seed.

Storage in air-tight tins was most satisfactory under all conditions. Even though one or two failures occurred with paper packets in linen bags, they were more suitable than chlorinated rubber and waxed cellulose packets. It may be that the moisture contained in the atmosphere in certain localities diffuses more freely through the paper container.

MOISTURE-TESTING APPARATUS.

During the year the services of an undergraduate from the University of Queensland were availed of for the purpose of ascertaining the accuracy of a moisture-testing apparatus utilising a carbide-absorbent material.

The test revealed considerable discrepancies in determinations even within the same sample of grain and failed to compare favourably with the Brown-Duval apparatus, the standard method used by the Standards Branch. Consequently, use on grain of a moisture-testing apparatus utilising a carbide-absorbent material, even for rough field tests, cannot be recommended.

CERTIFIED SEED.

Table 3 sets out the amounts of certified seed produced since 1950. The table groups the quantities of seed certified into seasons, thereby indicating the amount of seed available for the following planting season.

TABLE 3.

CERTIFIED SEED PRODUCTION.

Crop.	1950.	1951.	1952.*
Hybrid Maize (bush.) ..	2,822	4,287	300
Grain Sorghum (bush.) ..	1,550	5,052	..
Sweet Sorghum (bush.) ..	171	..	..
Sudan Grass (bush.) ..	78	383	..
French Beans (bush.) ..	140	..	3¼
Tomato (lb.)	128¼	99	115

* These figures are incomplete.

Drought conditions caused a loss in yield of many hybrid maize and sorghum crops during the later part of the 1950-51 season. The continuance of the drought into the 1951-52 season prevented approximately 40 acres of hybrid maize and 120 acres of grain sorghum from being sown. In addition, 11 acres of hybrid maize and 50 acres of grain sorghum failed to reach maturity due to lack of rain following planting.

Bean seed production received a further setback when crops on small areas at Townsville, Ayr and Redcliffe were rejected due to the presence of bacterial blight. It was hoped that these crops would supply sufficient seed for larger-scale plantings in the Kingaroy district.

During the year, the certification scheme was extended to include cowpeas, the variety approved being Reeves.

A noticeable feature of certified seed production has been the increasing difficulty of some growers in obtaining satisfactory isolation. This has been particularly evident with hybrid maize in the Kingaroy district, where cancellation and substitution of areas and hybrids has been necessary.

GRASS SEEDS.

The current Rhodes grass season promises to provide a large harvest of seed of good quality, in contrast with the previous two years, when it was necessary to lower the standard of germination under the *Seeds Acts* to 20 per cent. It is very probable that the original minimum germination of 30 per cent. will be restored.

Paspalum dilatatum seed will be in very short supply due to the unsatisfactory seasonal conditions, rain falling at inappropriate periods.

Green panic seed is still of very low germinating capacity, the usual samples not being capable of higher results than 3-5 per cent. This is due to the gradual ripening process resulting in harvesting methods usually taking off far too much immature seed. Furthermore, sometimes the seed lacks maturation; if stored for some 3-4 months considerably improved germination is recorded in those samples which contain the necessary caryopses.

Considerable experience is required for the successful harvesting of these grass seeds. People without knowledge of the difficulties involved have suffered disappointment when the seed harvested was found to be of poor quality and therefore unsaleable. There is considerable scope for improvement in the mechanics of harvesting these seeds.

This matter has not been overlooked by the Department, and at Biloela Regional Experiment Station a comprehensive programme of investigations of possible methods of machine-harvesting of different species of grass is being conducted. Hand-saving of seed can give very satisfactory results if sufficient care is taken, but is far too expensive.

The large increase in the number of Rhodes grass seed samples examined in the current season, due to the satisfactory crop and the desire to export, has thrown an excessive burden upon the seed analysts, as importing countries require examination by the International method, which is a long process compared with the so-called Irish method.

REGISTRATION.

TABLE 4.

SUMMARY OF ACTION IN REGISTRATION SECTION.

—	1950–51.	1951–52.
Samples received from—		
Inspectors	137	152
Buyers	10	1
Samples analysed by Chemical Laboratory	209	150
Samples examined by Standards Branch	136	24
Licenses issued	639	626
Registrations effected	924	810
Registrations refused	35	15

During the year 810 preparations were registered under the Fertilisers, Stock Foods, Veterinary Medicines and Pest Destroyers' Acts. Licences were issued to 626 dealers in fertilisers and veterinary medicines.

The Pest Destroyers and Veterinary Medicines Boards considered claims regarding the efficacy of 269 preparations for which registration was desired, and of these 15 preparations were refused registration.

Inspectors submitted 152 samples, almost all of which were analysed by the Chemical Laboratory, and buyers submitted one sample. Of the 150 samples analysed, approximately one-third failed to comply with the guarantee or prescribed standard. Most of these were stock-food samples in which the protein found was below the guarantee—the direct result of the acute shortage of protein meals of animal origin. The supervision of stock foods and fertilizers is being reorganised and a closer check is to be kept on the quality of stock foods in an endeavour to ensure that the guarantee is maintained at all times.

Trouble arose through the death of pigs alleged to be due to feeding molasses with some harmful ingredient. Analysis of a sample of such molasses revealed the presence of lead. Investigation showed that the molasses in question had been contained in a drum which previously contained paint dryers. Obviously, the drum had not been satisfactorily cleaned out prior to filling with molasses. The matter was immediately taken up with all sugar mills and distributors of molasses, and the utmost care in marketing such material was urged.

Several instances of deaths of poultry, allegedly after normal feeding of mashes, were reported. Investigations revealed in each case the presence of a large excess of salt (in one sample more than 30 per cent. of salt was found), which most probably was the result of faulty mixing. The necessary steps are being taken by the manufacturer concerned to ensure closer supervision of mixing operations, including more frequent checks upon mechanical feeders.

TABLE 5.

FERTILIZER PRICES.

Name.	1949. November.	1950. 1st July.	1951. March.	1952. April.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Ammonium Sulphate (20·5% nitrogen) ..	22 17 6 (*a*)	26 17 6 (*a*)	26 17 6 (*a*)	34 7 6 (*a*)
Superphosphate (22% P_2O_5)	7 10 0 (*b*)	9 15 0 (*b*)	9 15 0 (*b*)	13 17 9 (*b*)
Blood and Bone (5 : 15 : 0)	8 10 0	8 10 0	12 10 0	14 15 0
Muriate of Potash (60% K_2O)	30 18 0	30 18 0	34 8 0	38 8 6
Sulphate of Potash (48% K_2O)	..	..	..	45 5 0

(*a*) Less 7s. 6d. for cash.

(*b*) Less 5s. for Cash.

FERTILIZERS.

Table 5 sets out the prices of fertilizers (f.o.r. Brisbane) for the years 1949 to 1952. A Commonwealth subsidy of £500,000 was paid during the year to assist purchasers of nitrogenous fertilizers, which include sulphate of ammonia. Unless this is continued, the price of sulphate of ammonia will inevitably show a rise.

The demand for nitrogen for munitions production is an unknown factor, so it is not possible to give any indication as to the supply position for sulphate of ammonia for the future. Additional production of this nitrogenous fertilizer at Risdon (Tasmania) is not likely to be commenced in the near future; in the meantime Australia is dependant upon importations from overseas to provide sufficient to meet the demand.

As previously stated, this State is in the fortunate position of being able to use pyrites from Mt. Morgan for the production of superphosphate. This not only ensures an adequate supply of superphosphate but relieves southern railways of having to transport an increasing tonnage to Queensland, which could have reduced the quantity of sulphate of ammonia conveyed by rail.

The Queensland price of superphosphate (£13 17s. 9d. per ton) should be compared with prices in other States, which vary from £13 18s. to £15 12s. 6d. There does not appear to be any prospect of a reduction in fertilizer prices; rather, freights and other costs are rising. In 1938, sulphate of ammonia was sold retail for £12 per ton, which is less than the freight per ton now charged from Europe to Brisbane.

STOCK FOODS AND FERTILIZERS OF ANIMAL ORIGIN.

Considerable difficulty is being experienced in maintaining the crude-protein content of stock-food mixtures. The demand for high-protein meals of animal and vegetable origin has increased, while production has decreased. In addition, both vegetable-growers and cane-growers are greatly perturbed at the shortage of fertilizer materials of animal origin.

The manufacture of fertilizers and of stock foods of animal origin are inter-related due to the common origin of the raw materials. Stock-food material, however, must be made from animals slaughtered for human consumption and sterilized as prescribed. A perusal of the figures setting out livestock killings shows a marked decline due to the adverse dry conditions which were a feature of the period under review. Any contribution to the supply of materials of animal origin by the whaling station soon to start operations in Moreton Bay will be greatly welcomed by all concerned.

IMPORTS AND EXPORTS.

Details of the goods examined at the port of Brisbane for the purpose of the Quarantine Act and/or Commerce (Trade Description) Act are set out in Table 6.

TABLE 6.

SEED IMPORTS AND EXPORTS EXAMINED.

Kind of Seed.	1950–51.	1951–52.
Imports—		
Farm Seeds—		
Clover ..	2 lb.	28 sacks
Lupins ..	147 sacks	233 sacks
Lucerne ..	..	30 sacks
Mangel ..	38 sacks	18 sacks
Rape ..	67 sacks	47 sacks
Ryegrass ..	..	4 sacks
Vegetables—		
Beans ..	69 cwt.	190 cwt.
Miscellaneous	3,356 lb.	6,808 lb.
Parcel Post	261 parcels	252 parcels
Peas ..	60 sacks	240 sacks
Exports—		
Grass seeds ..	450 sacks	624 sacks
Miscellaneous packets of seeds ..	379 packets	139 packets

Reports were issued on samples of grain, submitted by shippers or agents and representing the quantities set out in Table 7, in connection with which the buyers' terms of contract stipulated that a certificate be issued. These figures do not represent the total exports.

TABLE 7.

QUANTITIES OF EXPORT GRAIN EXAMINED.

Kind of Grain.	Quantity.
Canary seed	745 bags
Cowpeas	4 bags
Millets	8,307 bags
Rye Corn	600 bags
Sorghum	111,001 bags

PUBLICATIONS.

The following articles prepared by officers of the Branch were published in the *Queensland Agricultural Journal*:—"Queensland Certified Seed"; "Veterinary Medicines"; "Seed Testing Explained"; and "Storage of Seeds."

CLERICAL AND GENERAL DIVISION.

Mr. W. T. Gettons, Assistant Under Secretary.

The volume of clerical work in the Department continues to increase in accordance with expanding activities in all Divisions. While the Chief Office is reasonably well staffed with Clerk Typists, it is usually difficult to obtain suitable permanent assistance for centres outside Brisbane. It is still difficult to obtain young male clerks, as the trend towards taking up a trade or profession still continues.

Although it has not been possible to eliminate all overtime, it has been strictly limited and the cost in relation to the size of the Department is small.

"Re-Establishment and Employment Act, 1945-1951."

The Department continued the administration of the Commonwealth "Re-Establishment and Employment Act, 1945" relating to the payment of allowances to discharged members of the Forces engaged in agricultural occupations within the State of Queensland. During the year the "Re-Establishment and Employment Act, 1945" was amended and is now cited as the "Re-Establishment and Employment Act, 1945-1951". Under the amended Act, provision has been made whereby members of the Forces engaged in Korea and Malaya operations are eligible for payment of an Agricultural Re-Establishment Allowance. From 1946 until the 30th June, 1951, 2507 ex-servicemen received assistance. The recipients were engaged in the following branches of industry:—

	Number of Applicants engaged.
Wheat growing	64
Cattle grazing	74
Sheep grazing	58
Dairying	399
Pig raising	20
Mixed farming	510
Market gardening	405
Orcharding	59
Banana growing	153
Viticulture	5
Poultry raising	151
Apiculture	8
Nurseries	9
Pineapple growing	155
Sugar cane farming	303
Tobacco growing	30
Cotton growing	6
Peanut growing	16
Miscellaneous	82

The allowance is a Commonwealth grant made to eligible ex-servicemen to ensure that they receive an adequate living allowance during the first twelve months of their commencing in an agricultural occupation after discharge from the Forces.

It is necessary that application be made within five years of any of the following dates, whichever is the latest:—

1.—

(*a*) the cessation of hostilities.

As September 2nd, 1945, is regarded as the date of the cessation of hostilities those persons who were discharged on or before that date ceased to be eligible to apply for the allowance as from 2nd September, 1950, unless they received or are receiving rural training under Part III. of the Act;

(*b*) The date on which the applicant ceased to be engaged on war service, provided such date was not later than 30th June, 1949; (except in the case of Korea and Malaya operational Forces);

(*c*) The termination or completion of any training which the applicant received under Part III. of the "Re-Establishment and Employment Act, 1945-51", or:—

(*d*) In the case of Korea and Malaya operational Forces the accepted date for eligibility would be based on enlistment date on or after the 26th June, 1950, in the case of Korea Forces and 28th June, 1950, in the case of Malaya, or:—

2. Where the applicant is a widow, within five years of the latest of any of the undermentioned dates:—

(*a*) The cessation of hostilities;

(*b*) The date on which the applicant's husband ceased to be engaged on war service, provided such date was not later than 30th June, 1949 (except in the case of Korea and Malaya operational Forces);

(*c*) The termination or completion of any rural training which the applicant's husband received under Part III. of the "Re-Establishment and Employment Act, 1945-1951."

Ex-servicemen who were discharged after 2nd September, 1945, are eligible to apply at any time up to five years from their date of discharge from the Forces, provided such date of discharge was not later than 30th June, 1949, (except in the case of Korea and Malaya operational Forces). If they received rural training under Part III. of the Act, the maximum period of five years for lodgment of applications will commence to run from completion of such training.

Those persons who enlisted before 30th June, 1947, and who were still in the Forces at 30th June, 1949, on other than a career basis, are deemed to be discharged at 30th June, 1949, for the purpose of calculating the five-year period from the date of discharge within which application must be made.

Transport.

The effective official vehicular strength of the Department at 30th June, 1951, was 198 cars and utility trucks. During the year 17 of these vehicles were transferred to the Bureau of Sugar Experiment Stations, reducing the department fleet to 181. Forty-two new vehicles were purchased to replace old machines condemned by the Chief Inspector of Machinery and of these condemned vehicles 25 were sold and 17 were in the process of being sold at the end of the year.

A total of 1,273,573 miles was travelled during the year by Q.G. transport at an average cost of 7.37d. per mile exclusive of depreciation. The average mileage per gallon of petrol was 19.1 for cars and 17.2 for trucks.

In addition to the foregoing, 209 permanent and temporary officers operated private motor cars for official purposes on a mileage allowance.

The official fleet is not entirely adequate to provide transport for officers endeavouring to meet increasing demands for their services, and, in consequence, the maximum use cannot always be made of the services of some officers who have been trained for field advisory work. Some officers also who formerly operated private cars for official purposes have been unable to replace them because of the high cost of new vehicles and this has imposed an additional strain on the available resources. Conjoint use of vehicles has been tried at the larger centres where several vehicles are stationed in an endeavour to make the most effective use of all vehicles, but it has been found that the practice usually results in waste time for at least one of the occupants.

Information Services.

The Department's monthly farmers' advisory publication, *The Queensland Agricultural Journal*, which commenced publication in 1897, continues to provide the State's primary producers with advice and instruction on many aspects of crop and livestock husbandry. Nearly 14,000 producers subscribe to this journal, and it is sent in addition to numerous educational and research institutions throughout the world.

During the year, fruit and vegetable growers were catered for by a series of comprehensive articles on crops such as apples, peaches, papaws, strawberries, grapes, beans and peas, while among the field crops, linseed, broom millet and pumpkins were given special attention.

A series of articles describing various agricultural and horticultural districts was continued. This series is proving valuable in providing well-illustrated matter for intending settlers unfamiliar with Queensland conditions.

A report on the progress of investigations into pastures suitable for the wet tropics created considerable interest, as did an article on bush hay conservation on a sheep property in the north-west.

The sheep blowfly, which costs wool-growers vast sums in bad fly years, was the subject of a series of articles desinged to acquaint pastoralists with the flies involved and methods of preventing and controlling fly strike.

Colour was introduced to the journal in a special supplement dealing with duck shooting in Queensland. Various considerations prevent the extensive use of colour in the journal, but black and white illustrations are freely used, an average of over 30 per issue being included in 1951-52.

A supplement containing the performance records of all dairy cattle included in the purebred herd recording scheme was issued during the year, and every month a list of pig herds qualifying under the brucellosis testing scheme and a list of tuberculosis-free cattle herds were published. This information provides a guide to farmers desirous of purchasing breeding stock from Queensland studs.

The space allotted to advertising was fully utilised throughout the year. Though it is understood that none of the lines or services advertised bear the Department's imprimatur, every care is taken to ensure that nothing misleading or inimical to producers is published. In particular, advertisements for farm supplies such as fertilizers, pest destroyers, veterinary medicines, stock foods, and seeds are examined to see that descriptions and claims are accurate.

Journal articles provide the material for advisory leaflets to be distributed to farmers by the branches concerned. During the year, some 157,000 reprints of 59 articles were ordered by 14 branches.

Very extensive use was made by newspapers of material sent to them each week in the form of a news bulletin. The items supplied are mainly of an advisory nature and the main provincial papers display them in a form designed to attract the notice of primary producers. Some southern farming papers circulating in Queensland use selected items. Rural broadcasters have also made very good use of news bulletin material. The distribution to newspapers and other users is 90 copies.

Newspapers and radio news services have been supplied with numerous statements on Departmental activities and a number of special articles have been prepared.

Scientific articles on a variety of subjects were presented during the year for publication in the Department's quarterly scientific journal, *The Queensland Journal of Agricultural Science*. The contributions covered such subjects as the Hammond system of pig carcase appraisal, the bactericidal efficiency of vacreators, wilt disease of the passion vine, new species of fruit flies, the phytotoxicity of Bordeaux mixture to tomatoes, milk quality tests, prevention of borer attacks on hoop pine logs, jassid resistance in the cotton plant, drought studies, potato tuber moth investigations, and fluorosis in sheep. A paper published in this journal earned for its author (Mr. L. E. Nichols) the 1952 Silver Medal of the Australian Society of Dairy Technology. An extensive exchange of the journal for publications of scientific institutions was maintained.

The second edition of Volume III. of the Department's Agricultural and Pastoral Handbook series was almost completed during the year and will shortly be available for purchase by producers, teachers, students and other interested people. The volume is concerned with insect pests and diseases of plants. It contains 560 pages and 311 illustrations. Material is still being assembled for comprehensive second editions of Volumes I. (Field Crops and Pastures) and II. (Horticulture).

Distribution of the Queensland edition of *Dairy Farming in Australia* was made during the year by the Commonwealth Department of Commerce and Agriculture. The book was published by the Commonwealth Government out of Commonwealth Dairy Efficiency Grant funds. Most of the advisory material was written by officers of the Department of Agriculture and Stock.

The Information Branch handled numerous miscellaneous enquiries, including many from prospective migrants concerning farming in Queensland.

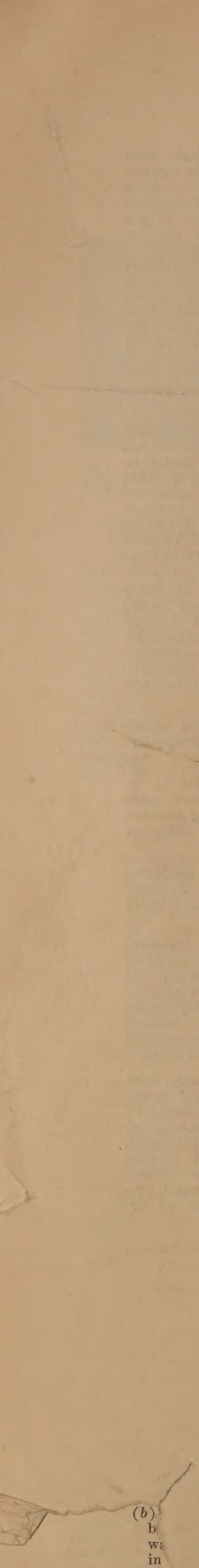
The Department continued to use radio as an extension tool and numerous broadcasts were made through National and commercial broadcasting stations. These included 52 prepared and delivered by officers of the Information Branch.

For the second year, a theatrette was conducted at the Royal National Association's Show in Brisbane and documentary films on various aspects of primary production were shown.

The Photography Section performed an increased volume of developing and printing work as a result of the more extensive use of cameras by field officers. At the same time, many visits were paid to farms by section photographers for the purpose of photographing material for advisory and research purposes. Lantern slides and film strips were prepared for lecture purposes and some cinematograph work was also carried out.

The Central Library handled a considerable number of enquiries from Departmental officers and others. A very large number of periodicals is now received by the library, and there is a large daily receival of pamphlets and bulletins from many parts of the world. Continued decentralisation of Departmental services means heavier calls on the library by country officers, while a broadening of the scope of Departmental projects at Head Office has meant greater use of the library by Head Office officers also.

A. H. Tucker, Government Printer, Brisbane.



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